XIV.

DEFLECTIONS OF THE NASAL SEPTUM; A CRITICAL REVIEW OF THE METHODS OF THEIR CORRECTION BY THE WINDOW RESECTION, WITH A REPORT OF 116 OPERATIONS.

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In this article I again describe my methods of operation as further experience has improved them and contrast my work with that of others; for since the appearance of my last paper, the "Window Resection," (Journal of the American Medical Association, December 5th, 1903) several articles on the submucous resection of deflections of the septum have been published. The most complete of these is that of Killian (Die submucoese Fensterresektion der Nasenscheidewand, Fraenkel's Archiv fuer Laryngologie, Vol. 16, page 362, 1904), but Hajek (Bemerkung zu der Krieg'schen Fensterresektion, Fraenkel's Archiv fuer Laryngologie, Vol. 15, page 45, 1904), Menzel (Zur Fensterresektion der Verkruemmten Nasenscheidewand, Fraenkel's Archiv, Vol. 15, page 48, 1904), Leon

E. White (Resection of the Nasal Septum, Boston Medical
and Surgical Journal, Vol. CL, page 419, April, 1904), Weil,
(Ueber die submucoesen Resektionen an der Nasenscheide-
wand, Fraenkel's Archiv, Vol. 15, page 578, 1904), Zarniko,
(Ueber die Fensterresektion der Deviatio Septi, Fraenkel's
Archiv, Vol. 15, page 248), Erhard Mueller (Zur Technik
der Fensterresektion, Fraenkel's Archiv, Vol. 15, page 312)
and Spratt (The Removal of Septal Spurs and the Correction
of Deviations of the Septum, American Medicine, May 7,
1904) have also written important papers on the subject.

The Nature of the Deflections Encountered.—The num-
ber of submucous resections of deflections of the septum
performed by me to the present time is 116. Ninety-six of
my patients were males, 20 females; a disproportion in accord
with general experience. Sixty-seven were young adults, 20
were middle aged; 23 cases were between 12 and 17 years of
age and 6 were young children, two of them eight, two nine,
one ten and one eleven years old. Fifty-six of the deviations
were in the left naris and 52 in the right, an inconsiderable
difference. Eight deflections were sigmoid horizontally and
obstructed both nares at the same time. In twelve patients
the deflection was so extreme that the septum applied itself
along nearly its whole length to the lower and middle turbi-
nated bodies, causing obliteration of the nostrils. In these
cases the operation to create practically a new nasal fossa.

Only 41 of the deviations were purely cartilaginous, 66 were
composed of bone and cartilage, while 9 were entirely bony.
The majority of the deflections, 66, were double-angled, of the
type which presents a distinct vertical angle (Fig. 1 and 2) in
the cartilage extending in rare cases up into the perpendicu-
lar plate, and a horizontal angle beginning commonly in the car-
tilage and extending backwards and upwards, usually along
the superior border of the vomer, in the form of a wedge, the
crista nasalis inferior (crista incisiva) and the vomer curving
outwards above the nasal floor to form its lower plane. On the
concave side in the double-angled deflection is seen a trough
with V-shaped bottom ascending upwards and backwards, cor-
responding to the horizontal angle on the convex side, while
the vertical angle, which usually juts out strongly on the side
of the convexity of the deviation, is generally merely indicated
by a gentle depression. Another type of angular deviation
which I call the crest-like deflection, appeared 22 times among

my cases. In this class the vertical angle is absent, there being merely a horizontal angle not differing from the one just described. It is this variety of deviation that is commonly sawed off as a "ledge, crest, ecchondrosis or exostosis" under the impression that the septum is plane or nearly so on the other side, for the concavity may not be seen because hidden deeply in the naris, but more often it is simply not looked for.

The insight into the septal skeleton, given me by my resections, has convinced me that solid crests or ledges resting upon a plane septum or even upon the summit of a deviation are much rarer than evenly hollowed out deflections, the acute angle of whose apex simulates a solid prominence. Among all of my deflections but 6 possessed noteworthy crests as a complication. Personal association with operators has shown me that the impression prevails that solid ledges arising from a straight or slightly deviated septum are frequent, and under this impression the summit of deflections is sawed off, leaving the mass of the deviation to continue to obstruct the naris or else, if the saw penetrate deeply, a perforation is made.

The posterior part of the horizontal angle of deflection is often visible by posterior rhinoscopy and is seen to extend near or even up to the posterior border of the vomer. (Fig. 3.) The latter, however, almost always stands vertically in the centre. Figures 4 and 5 show deflections in which this was not the case. One of these patients had not only marked deflection of the entire septum but also a congenital bony atresia of the choana, shown in the drawing.

Eight of the deflections were bowed or C-shaped horizontally and vertically. Bowed deflections are frequently extreme, begin far in front and often look like a red tumor projecting into the nostril. The vertical angle is replaced by a rounded bulging of the front of the septum into the obstructed naris, usually beginning at the anterior inferior free border of the quadrangular cartilage, which projects across into the opposite nostril. The bowed deflections are apt to extend far back into the bony septum, the bony part of the deviation usually presenting the typical horizontal angle described.

Ten of the deviations were of such an irregular form that they could not be classified. In two of these the vomer was bent horizontally upon itself in its posterior half, producing an acute angled vertical deviation that projected transversely across the naris, crowding into the lower turbinated body

(Fig. 6 and 7) and making the resection very difficult. In 20 cases the dislocation of the anterior inferior free border of the quadrilateral cartilage (so-called columnar cartilage) from its proper seat above the septum cutaneum, (septum anticum of. Kretschmann, Fraenkel's Archiv. fuer Laryngologie, Vol. 14, page 562, 1903) referred to under bowed deflections, occurred. In these deviations the anterior plane of the vertical angle lies across both nares obliquely from behind forward, the anterior angle of the quadrilateral cartilage being displaced from its normal position between the median plates of the alar cartilages, and the inferior angle from its attachment to the crista incisiva, so that the dislocated anterior inferior free border of the cartilage of the septum is seen as a projecting ridge under the skin in the nostril of the concavity, beside the septum cutaneum (Fig. 8). Eight deviations were sigmoid horizontally, blocking both nares.

Thirteen perforations into the opposite naris occurred. Nine of them were minute; the largest of the size of a pea. Three were larger; of the size of a thumbnail. Six perforations were made in my first 15 cases; 3 were unavoidable as they were made in cicatrices due to previous operations. In the last 101 cases there were 5 perforations. None of them led to scab. bing or caused their possessors discomfort.

Killian's Grouping of Deflections.—Killian divides deflections into two groups, one due to faulty growth of the septum and one due to traumatism. In describing the former group he says that the strongest convexity, as a rule, corresponds to the upper border of the vomer, but that the quadrilateral cartilage may be bent below or high up, (in what form is not stated) in the latter case the deviation usually involving the perpedicular plate. He states that crest formation is seldom absent in natural deviations and that these crests always follow the superior border of the vomer, ascending obliquely from below upwards. He finds marked deviations usually associated with the formation of a marked ledge or crest.

Traumatic deflections Killian describes as always occupying the anterior part of the septum, in the region of the cartilage, but he says that they may extend more or less extensively into the bone and that the type of deflections due to injury is acute angled, the fractured lamellae of the quadrangular cartilage forming a sharp angle whose planes approach each other from above and below, the groove of the concavity extending from

before backward. The anterior portion of the septum undergoes torsion about its vertical axis and closes the hollow of the concavity from in front, its free border projecting into the open nostril, its anterior surface presenting broadly in the obstructed one. Where the fractured lamellae are joined the cartilage is thickened and the fragments may overlap.

Portions of this description by Killian bring to my mind deflections as I have found them, but I fail to recognize what has seemed to me typical in a great part of it. I certainly have found nothing that suggested to me a division into a traumatic group and one due to faulty growth. I do not think that a deflection should be called traumatic simply because its shape indicates traumatic origin, even though this suggestive form be accompanied by the patient's history of an injury to the nose in the past, for blows upon the nose are so common that he is quite sure to recollect one to which his trouble might be attributed, even though his deflection be obviously not traumatic, as for instance a bony deviation far back.

The majority of my deviations had an acute vertical angle, usually far forward in the naris, that would have accorded with Killian's description of the traumatic deflection, yet in only a few of these did the patients date their trouble distinctly from a violent blow upon the nose, and in these there was usually a clear history of fracture of the nasal bones. Even in cases of fresh injury where a blow was severe enough to fracture or displace the nasal bones from their attachment, I have commonly merely found the cartilage of the septum carried over to the right or left, or gently curved, and I have not seen acute angled fractures of the cartilage shaped like an angular deflection even in these severer injuries. I have no doubt that they occur where the cartilage is unusually brittle, but as a rule it is so resilient that it springs back into its original shape. This is proven by the difficulty experienced in preventing the elasticity of the cartilage from reproducing deflections corrected by the fracturing operations. Acute angled deviations of the cartilage are extremely common, yet according to my experience their acute production from fracture is very rarely seen, though an injury sufficient to create such a fracture would certainly be severe enough to bring the patient to the surgeon for inspection.

Killian speaks of traumatic deviations that are continued into the bone. It does not seem mechanically reasonable that

force enough should be conveyed by the elastic cartilage of the septum to its bony skeleton to break either the perpendicular plate or the vomer. The fact, therefore, that a cartilaginous deflection is continued into the bone is to my mind an argument against its traumatic origin. I think, therefore, that while traumatic deviations occur their frequency is overestimated and that it is better to leave the supposed etiology of deflections out of the question in grouping and describing them.

The Influence of Age upon the Operation.— Children.— The ages of my patients as shown varied between the extremes of 50 and 8 years. The healing in my middle aged and oldest patients was as rapid as in younger ones. Killian advises against intranasal surgery in old persons except for urgent indications. Aged people have never demanded the operation of me, but I should perform it upon robust patients up to the age of 60.

Killian's statement, that as a general thing children younger than twelve are not fit subjects for the window resection, is not in accord with my experience, and I should operate on children at any age, though so far my youngest patient was eight years old. Dr. Herman Stolte of Milwaukee successfully resected the septum of a child of five. Erhard Mueller reports 3 successful operations upon children under 10, one of them 6 years old. Killian contends that the smallness of the field in children, the need of general narcosis and our inexperience as to the effects of further growth of the septum, are contraindications. I have not found my 6 operations on children difficult, as my slender instruments are perfectly adapted to a small operative field and the combination of cocain anesthesia with chloroform makes the slightest narcosis suffice.

To investigate the effects of growth upon the resected septum, I recalled for examination my first 3 child patients of the ages of 9, 8, and 9, at the time of operation and operated upon respectively 18, 10 and 7 months before the time for reinspection. All of these children had had unusually extensive osseocartilaginous deflections and in all of them the septum had become entirely firm at the site of the window and the cartilage and bone seemed to be replaced. The deflection in the first child was partly reproduced. The result in the other two remained perfect.

The first child had a double angled deflection of extreme

type causing obliteration of the right naris. The external bony
and cartilaginous nose was curved in the form of a C towards
the obstructed nostril and the whole septum was arched over
into the occluded nasal fossa. A large window was made ex-
tending from the nasal vestibule far back into the bony sep-
tum. The anterior inferior free border of the quadrangular
cartilage projected somewhat into the left naris but not enough
to make its removal seem necessary. When the patient was
re-examined after 18 months the cartilaginous part of the de-
flection was found to be one-half reproduced, the naris being
one-half clear in front, instead of entirely free, as it was a
few weeks after the operation. There was no reappearance of
the bony obstruction.

The second child had required an extensive resection of a
crest shaped deflection from the front of the nostril to nearly
the posterior border of the vomer. The re-examination in this
case in 10 months showed a straight septum and ideal results.

The third child had an extreme angular deflection with
double angle obliterating the right naris. The bony deflection
extended back to near the posterior border of the vomer. In
this case the naris was also found perfectly free 8 months after
operation.

The first case shows that growth in children tends to repro-
duce a deflection in part unless every vestige of it be removed,
for I do not think that there would have been a return even in
this extreme case if I had resected the dislocated anterior in-
ferior portion of the quadrangular cartilage from the naris of
the concavity, for it was this residue of the deviation that
caused the front of the septum to continue to grow in a faulty
direction.

My conclusion, therefore, is that the operation is proper for
children at all ages, but that it does not suffice to merely resect
enough cartilage and bone to establish free respiration if the
septum is to grow in a vertical plane.

Permanency of Result.—To test the permanency of the re-
sult of the operation in adults I have sent letters to a num-
ber of my earlier patients and so far 10 have responded. The
time elapsing between operation and examination was 2 years
and 11 months in 2 case, 2½ years in 5 cases and about 2 years
and 2 months in 3 cases. In 5 of these patients the site of the
window was firm, showing that probably the cartilage and
bone were reproduced. In 4 cases, all of the window except

an area in the centre of the size of a bean to a dime was firm, showing that probably some cartilage had reformed from the edges of the window. I think that my more recent cases will show a larger percentage of entirely firm windows, as practice enables me to save the periosteum better than I did.

In one of the re-examined cases a perforation made by the operation existed. It had smooth borders, did not scab and caused the patient no inconvenience. The result was ideal in all of the cases re-inspected, nasal respiration was free, it was usually impossible to see that there had been an operation, and in no case was there any sinking in of the bridge of the nose, or formation of scabs.

Possibility of Damage to the Nasal Profile.—Some operators hesitate to adopt the window resection, urging that though it does not itself cause the bridge of the nose to sink in, its support is nevertheless weakened, so that a blow on the nose would readily flatten it. The effect of severe blows upon the nose has been tested in four of my cases. Two of them were boys, one aged 15 and the other 16. In the first case the deflection was confined to the cartilage, a large window being made, reaching from the nasal floor high up to the perpendicular plate. Seven days after the operation the patient was struck violently on the nose by a man's elbow, nose-bleed for fifteen minutes resulting. When seen two days later the nasal bridge was not depressed in the least and the septum remained straight.

In the second case the deflection was also cartilaginous with a sharp vertical angle, and extended from the front of the septum to its bony part. Twelve days after the operation the patient bumped his nose forcibly into another boy while running. Prolonged nose-bleed followed, but when he was examined 19 days after the operation, there was not only no deformity of the external nose, but the window was already filled with tissue as firm as cartilage.

The third patient came to me $2\frac{1}{2}$ years after the operation. He had received a blow on the nose a week before he came for re-examination. The nasal bones had been dislocated to the left, their connection with the frontal processes of the superior mixillary bone being broken. They had been replaced and the bridge of the nose was still swollen, but was not depressed in spite of this violent injury and the septum remained straight. In this case an angular, purely cartilaginous deflection, extend-

ing high up into the perpendicular plate, had been resected.
The fourth patient received a blow from a man's hand on his
nose 3 weeks after an extensive resection of an osseo-cartila-
ginous deflection reaching to the front of the septum and up-
ward into the perpendicular plate. No damage beyond nose-
bleed.

Mueller says that a slight saddle nose may result if a wide
enough strip of the anterior highest part of the quadrangular
cartilage be not retained, as this part supports the dorsum of
the nose. Mueller especially warns against pulling or break-
ing away cartilage in this region, as several times when he did
this distinct but not marked sinking in of the nasal bridge fol-
lowed. Pulling or breaking out of fragments of cartilage has
always been excluded from my method and there is no need
of it, as my cartilage knives pare off the cartilage cleanly and
exactly where it is desired.

Mueller has also, he thinks, seen slight retraction of the pro-
file from cicatricial retraction of the septum as a post-opera-
tive sequel. This may be due to the fact that he sacrifices the
mucosa of the convexity, after Krieg, and so creates a large
cicatrizing surface.

Menzel says that "one is certain to obtain a saddle nose, a
sinking in of the cartilaginous bridge, if one resects the car-
tilaginous septum too closely to it." He saw such deformities
among his first cases, due, he thinks, to retraction of scar tissue
forming between the two layers of the mucosa. Menzel ad-
vises the retention of the portion of the cartilage of the sep-
tum corresponding to the dorsum of the nose to the extent of
a strip 1 to 1½ centimeters in width. I agree with
Mueller that in some deviations high up and far
forward, the under surface of the lateral cartilage of the
external nose must be approached more closely than this, in
resecting, to sufficiently free the naris. Although I have never
seen the least sinking in of the nasal bridge after the opera-
tion and Killian does not even mention it, I think that never-
theless Mueller's and Menzel's warning should be heeded and
that, in deflections far forward, a buttress of cartilage, at least
½ a centimeter deep (Fig. 9, b. b.) should be left behind the
nasal bridge above the alar cartilages. In the great majority
of cases it is needless to resect so closely to the nasal bridge
that its support comes into question.

In contra-distinction to the part of the quadrangular carti-

lage immediately underneath the lateral cartilages just mentioned, all of the lower portion of the quadrangular cartilage, extending back horizontally behind its free border and anterior angle, up to the level of the top of the alae nasi, may be resected back to the bone without fear. (Fig. 9 aa.) The needlessness of this part of the cartilaginous septum is shown by the many cases where it naturally extends across both nostrils, curled up, dislocated from its attachments and obviously supporting nothing, the nasal profile of the individual nevertheless being faultless in spite of the many accidents to which noses are exposed. However I agree with Weil that only deflected cartilage should be sacrificed and that for this reason it is objectionable to begin the resection at the free border of the cartilage for all deviations, even for those beginning a distance behind it, as is done by Hajek and Menzel. I do not think with him, however, for the reasons stated, that the support of the external nose depends at all upon the lower portions of the cartilage outlined above. In a number of cases I have resected, when this portion of the cartilage was deflected, from the anterior angle and free border far back into the bony septum and the bridge of the nose has always stayed straight.

Incomplete Operations.—Some operators speak of the window resection as a simple little operation that may be done with a few ordinary instruments. In a series of resections some will always prove easy and a number of these among the first cases readily leads to the thought that they are all easy. In addition there is a tendency among some operators to resect only enough of the deflection to partly free the naris. Thus, they may remove only the cartilaginous part of the osseocartilaginous deviation, or only the prominent parts of the bone and cartilage. A half operation of this kind is of course usually easy, but it is sometimes a fatiguing and difficult matter, requiring special instruments to radically extirpate a deflection to its limits. This should always be done, however, for the cocain and adrenalin employed make the naris for the time abnormally clear, and when the shrinkage of the mucosa so created passes off, sufficient patency does not remain unless all of the deviation be gone. The result is satisfactory when the posterior wall of the nasopharynx and the motions of the levator palati muscle can be plainly seen through the naris which has contained the deflection.

Description of the Operation. — Preparations. — The operation is to be done according to the rules of aseptic surgery, a knowledge of which may be presupposed. Though it is desirable, as Killian does, to operate in a special aseptic operating room, most rhinologists have to do the work in their offices or in clinical rooms used for all cases. Though this has been my case, I have had no trouble from sepsis, except in 3 early cases, where there was transient suppuration of the wound which hardly delayed healing. There has been nothing of the sort in my last 72 operations. An important preparatory step is the clipping away of all vibrissae, so that the nasal vestibule may be well cleansed and the view of the operation be unobstructed.

Though the nasal fossae back of the vestibule, as Killian states, contain no virulent germs when healthy, and need no cleansing before an operation, the surgeon may be called upon to perform it in nares affected with acute or chronic rhinitis, secreting muco -pus and obviously superficially infected. Killian says that in these cases "if the submucous operation be nevertheless indicated, one may try to cleanse the nose and weaken the virulence of bacteria by irrigation with weak antiseptic solutions." This treatment would merely remove secretion from the surface and leave the tissues still infected, and in such cases I defer the operation until I have subdued the suppuration with daily irrigations followed by swabbing of the general mucous surface and meatuses with a 25 per cent solution of argyrol. This penetrating silver salt usually stops the infectious discharge and makes the operative field safer than if one resected at once. In sinus disease one may have to operate in spite of chronic suppuration.

Position of the Patient.—The sitting position for the patient seems to be the only one employed excepting by Leon E. White and myself. In my earlier operations I also used no other but since my 29th resection I usually, during the greater ·part of the resection, have the patient lie upon an operating table that can raise or lower his head to the required level. The patient lies upon his back while the operator stands at ease beside him, instead of bending over towards him in a strained position, as he does when both are sitting. When the patient reclines the assistants holding the retractors and swabbing can see better what they are doing, the patient is at rest, has none of the attacks of faintness at the beginning of the

operation that he is liable to when he sits up, and he does not suffer the discomfort of having to hold his head fixed in a rigid position. The flow of blood is usually so slight that it is all or nearly all swabbed away, the few drops that run back into the pharynx being swallowed by the patient or hawked up at intervals so far apart that the course of the operation is hardly disturbed. Operating in the cartilaginous septum and in the bone above the lowest parts along the nasal floor is made less difficult by the patient's recumbent position, but it is easier to resect a deflected crista incisiva or foremost part of the vomer when he is sitting. When he does so I employ a headrest for him or have an attendant steady his head. Some fullblooded people in lying down have continuous oozing of blood from the wound and such persons should also sit in the chair.

Lights Employed.—I still regard the Kirstein electric headlamp (Fig. 10) as the most suitable light. It makes the operator independent of a source of light for reflection, a great advantage, for such a light is in the way of assistants and as it can not be used when the patient is recumbent, the operation is interrupted, if he needs to lie down, because of faintness. The Kirstein light is preferable to the other electric headlamps as it is the only one which permits the operator to see deeply, as its rays are paralell to the axis of the surgeon's eye, which looks through the hole in the mirror. This is important in resecting bone far back in the naris where it is hardest to see and where a good illumination is needed. The objections to the Kirstein light are the frequent burning out of the expensive lamps, the frail connections, the need of a rheostat and the difficulty some have in adjusting the mirror to the eye. Those who prefer it may use a pigtail filament, 50 candlepower, stereopticon, Edison incandescent light (Fig. 11.) for reflection with the head mirror. This light gives an intense homogeneous field of illumination and may be adjusted so that it may be reflected from while patient is recumbent.

A number of operators have complained to me that the Kirstein light did not give sufficient illumination. This is due to the use of a rheostat which does not permit enough current to pass through it. The Kirstein light requires ordinarily from 10 to 12 volts and about an ampere, as it has a heavy filament. A rheostat which has a 50-candle power lamp in series on the 110-volt current will suffice. I use the O. C.

rheostat, a simple device which may be screwed into any wall socket.

Anesthesia.—Killian employs submucous injections of a ½ per cent. solution of cocain with 4 drops of suprarenum bydrochloricum (a German adrenalin preparation, 1 to 1,000 in physiologic salt solution) to 2 cc of cocain solution. Preceding this injection he applies a 20 per cent cocain solution to its intended site on the anterior lower part of the septum. He tries to force the fluid through a long needle between the perichondrium and cartilage if possible. One cc is injected on each side of the septum and the anesthetic gradually spreads until large portions of the septum lose their sensibility. Killian waits 15 minutes for local insensibility and immediately before operation also applies a 20 per cent. cocain solution to the mucous surface.

White packs the convex naris for ½ an hour with a pledget of cotton soaked in a 4 per cent cocain solution.

Menzel paints the mucosa of both sides of the septum with a 20 per cent solution of cocain and 1 to 1,000 adrenalin, then he uses Schleich's infiltration at the site of the incision and backwards between mucosa and cartilage on both sides.

In the exceptional cases where I resect from the free border of the cartilage, as I do where it is dislocated into the naris of the concavity, I inject submucously a 2 per cent solution on each side of it, for the thick epithelium over the foremost, lowest part of the septum hinders absorption from the surface. In all other cases, as formerly, I first swab adrenalin 1 to 1000 upon the sides of the septum, following it in about three minutes with pure powdered cocain, applied with a minute moist swab to the same regions. The concentration of the drug produces profound local insensibility, which is confined to the operative field and is so rapid that the first cut may be made in about five minutes after the application. Some who have watched me have contrasted the painlessness of my resections with the greater suffering caused by other operators and they attributed the perfect insensibility to the rubbing in of powdered cocain. I have never seen noteworthy cocain intoxication, though as the operation proceeds I repeatedly apply the pure drug to the wound surfaces to maintain the anesthesia and as a hemostatic. The entire amount of cocain absorbed is small and much of it is swabbed off again. I employ this method for all intranasal operations and except in the locality

mentioned I can see no reason for the troublesome submucous injections which, combined with additional swabbing with a 20 per cent. solution of cocain, certainly lead to the absorption of as much of the drug as my method does.

Weil suggests possible injury to the vitality of the flaps from Schleich's infiltration.

For children I combine chloroform narcosis with the application of cocain. Just enough chloroform is used to keep the child unconscious of its surroundings. As a rule hardly a half narcosis is maintained.

Assistance.—An attendant is needed to hold the nostril open with retractors and it is well to have one to swab the field of operation or hand swabs to the surgeon. At least sixty cotton swabs upon pointed applicators should be ready, to avoid the need of rolling new ones during the resection.

Specula.—Killian justly refers to the unfitness of the usual specula for the operation and has an attendant hold a single tracheotomy retractor to keep the naris open. I use my original flat retractors (Fig. 12, R. S.), one narrow and one broad, and find that a much better view is obtained with both of them than with a single retractor.

The Incisions in the Mucous Membrane.—Opinions all agree that it is best to resect from the convex side if possible.

For the usual deflection with a vertical angle, however slight, and a horizontal angle, I now make an incision of the shape of a capital L, looking backward, the vertical cut, as of old, following the angle of the vertical deflection and beginning high up on the septum above the deviation, the horizontal cut extending forward from the bottom of the vertical one along the crest of the horizontal deflection, if it be acute and projects greatly. If it be little pronounced, the incision is made along the nasal floor. The cut should extend to the very front of the septum in most cases. (Fig. 13.) This outlines an anterior flap with its base forward. The posterior extension of the horizontal cut, which gave the older incisions the form of an inverted T, I only use in bony deflections hard to reach. The reason for usually making the horizontal cut along the crest of acute angled horizontal deflections and not along their base is the frequently great adherence of the mucosa at the apex of the horizontal deflection and below it, so that its separation from below is difficult and it is better

to dissect it off downward from an incision made along the crest.

For crestlike deflections an incision is made from behind forward along the whole length of the crest of the deflection, curving the cut upwards at the front. This outlines a superior instead of an anterior flap. (Fig. 14.)

Many of the crest-shaped deflections begin far back in the naris and are nearly or entirely bony. In these cases I make my incision in the mucosa for entering the deflection in the manner of White, that is just in front of the deflection and not on its summit. A vertical cut is made extending from high up on the septum to its bottom so as to give the freest access to the operative field. If enough room·be not obtained a horizontal incision along the bottom of the septum may be added later.

The mucous membrane cuts are made with the knives with half round-edged or round-edged blades (Fig. 12, D, C, B, E, I), C and B being used for vertical angles occurring far back and I along the base of the septum in front. The incisions should go through the perichondrium, so that it can be elevated from the subjacent cartilage. If the cut does not go ·down to the cartilage the dissection takes place between mucosa and perichondrium, a difficult process, only possible with keen blades. Where the deflection extends across both nostrils and the anterior inferior free border of the septum is displaced into the naris of the concavity enough to obstruct breathing, I begin the resection by an incision from the free border of the septum on the concave side and from this dissect out as much of the deflection as can be reached in this way. If it extends far back into the bone I then make my usual vertical cut along the vertical angle on the side of the convexity and dissect from this. (Fig. 15.) The general principle of my incisions, in short, is to follow the summit of the angle or angles of deviation wherever they may be except in the deep-seated crestlike deflections mentioned.

In distinction to my method all other authors describe their mucous membrane incision as made at the front of the septum and in front of the deviation instead of over it. Thus Killian makes one cut about one-half centimeter behind the border of the septum mobile (*cutaneum*), but not parallel to it, for it ascends from behind and below upward and forward. White's cut is made vertically, just anterior to the deflection

from above its top to the nasal floor. Hajek and Menzel make a single cut beside the septum mobile directly upon the free border of the quadrangle cartilage, their incision being curved backward at each end. Krieg, Mueller and Boenninghaus make three incisions, one upon the free border of the cartilage, a second extending parallel to the back of the nose backward, and a third along the floor of the nose. The Krieg type of incision gives good access to the deflection, but leaves a loose flap badly shaped for preservation, and which it is the intention of Krieg and his followers to cut off at the end of the operation.

As the Killian, Menzel, Hajek and White incision is made in the foremost part of the septum, the remotest and most difficult part of the deflection behind must be reached from a point on the septum at the greatest distance in front of it. Their cuts give ready access to the anterior part of the deviation but sacrifice present gain for future difficulty, for it makes the portions of the deflection far back less accessible, and so encourages imperfect removal of the bony part of deflections.

With the incision at the front of the septum the operator resects under a long sac of mucous membrane on the convex side of ever increasing depth, so that it becomes more and more awkward to keep the detached mucosa out of the way, and for this reason Killian has added as a complication to the operation the use of his long speculum for rhinoscopia media (Fig. 16), to spread open the mucous coverings on both sides of the septum. Even a short speculum I have always found much in the way of sight and the free use of instruments, especially cutting foreceps, where the deeper parts are to be operated upon, and I do not wonder that Killian does not think the operation suited to little children if he blocks their little nostrils with his speculum.

Another objection to the mucous membrane incision far in front is the fact that it coincides with the first cut through the cartilage, so that if a perforation be made here it penetrates both coverings of the septum at once and hence remains permanent, while my anterior flap in this region overlies an accidental perforation through the mucosa of the concavity and closes it. The foremost part of the septum is the worst place for a perforation, as it crusts for a long time.

Mueller, in speaking of Hajek's and Menzel's incision, and

this applies as well to Killian's and White's, says: "How often does one meet with massive deep-seated obstructions, angular bends, bony prominences and spines in complicated noses, after free space has been made in the anterior half of the naris? To obtain a perfect result it is absolutely necessary to remove such obstacles. To reach them from a button-hole incision, seated in front in the region of the septum mobile, is very difficult, tedious and often absolutely impossible. In such cases one is forced, if one expects to succeed with Hajek's method, to be satisfied with a less perfect freeing of the nasal passages than those obtain who operate by Krieg's method."

Zarniko says: "I have discarded the simple straight cut of Menzel with short, curved continuations at the ends, as the view into the depths of the mucous membrane pocket did not suffice."

My incisions give as much access to the deeper parts and as much freedom for operation as Krieg's, and, nevertheless, the mucosa of the convexity is preserved.

My mucous membrane pocket begins not far in front, but at the vertical angle or summit of deflection, so that the separation of this posterior part of the mucosa of the convexity is easy and the short sac created by its elevation stays open, no long speculum being needed, the separated mucosa clinging with its epithelial surface to the turbinals, or, at the most, needing to be held off with a slender spatula. The greatest advantage of my incisions, therefore, is the creation of flaps that make the deepest bony parts of the deflection readily accessible. This is true of the reversed L, inverted T and single cut along the horizontal angle. The readiest access to a deflection is obtained by a cut along its summit.

The Instruments for the Separation of the Mucous Membrane.—The principles of this part of the operation do not seem to be clearly conceived by all, to judge from the number of unnecessarily large and massive instruments devised. The heavy bone implements of the general surgeon seem to have served as models for some of them. The problem is not so much to scrape off the perichondrium and periosteum from the septum as one would denude the tibia, as to undermine carefully the coverings of the deflection, for the instruments, on account of the position of the septum between two narrow cavities, must of necessity work nearly parallel to the surface attacked, especially on the concave side, so that scraping is

only possible to a limited extent in front. In addition, the soft, yielding, springy cartilage is not as suitable as bone for scraping with chisel-like instruments.

The undermining must be done in narrowest places, around corners and often at a great depth in the naris, by actual measurement in many of my cases two to three inches behind the front of the external nostril. The type of elevator demanded is, therefore, thin edged and flat, so that it may undermine readily; narrow, so that it may fit small nares; long and gently curved, so that it may work around corners and keep its edge always close to the surface to be denuded, lest it perforate the mucosa. Sharp and dull separators are needed, the dull one being merely without keen edge, but never blunt, as blunt instruments perforate readily by punching through in front of adherent places. The sharp elevator, and in addition my round-edged knives of various forms (Fig. 12, L. E. D. I.), are used for keen dissection in places where the covering of the septum is adherent. In the large majority of cases all of the separation may be done with the dulled separator, but the crests of deflection, the bottom of the concavity, cicatrices after previous operative attempts, quite often both sides of the crista incisiva and vomer below the horizontal angle of deflection, and occasionally the foremost part of the cartilage, are places where the covering may need to be dissected away in places instead of separating readily throughout.

The type of elevators used by Hajek and Spratt do not conform to the requirements mentioned. Spratt's are veritable chisels. Hajek has a blunt and a sharp elevator. (Fig. 17.) Both are clubbed at the end, straight, five-sixteenths of an inch wide and one-eighth inch thick. Such large instruments hide the view in narrow nares, and would be quite unfit for the minute nostrils of children. In the eleven cases of obliteration of the nostril encountered they could hardly have been wedged between the deflection and the inferior turbinated body, not to speak of conducting the elevation of the mucosa in such a narrow fissure. The sharp elevator has a thick edge, rounded on one side, and flat on the other, and is more like a raspatory than a dissector. A blunt round-edged separator, like Hajek's, is apt to plunge through the often frail perichondrium, periosteum and mucosa of the concavity if even moderate force be used in front of slightly adherent places, where a thin-edged dull

separator will undermine the covering, a fact that made me abandon blunt separators long ago. Hajek's elevators are made for an operation of strength rather than of delicacy. White's separators (Fig. 18) have a better form, but are straight and designed only for roomy noses. He speaks of "freeing the cartilage from its mucosa in a short time with these powerful instruments." He mentions no instrument for sharp dissection.

The most important instrumentarium recently brought to notice is that of Killian. His separators are thinner and better fitted for the work than those mentioned. For blunt separation he has a straight one (Fig. 19 A), and one curved (Fig. 19 B) at the end on the flat, both about ¼ of an inch wide and though I regard these instruments as too large for operating in children's noses I think they would fit the average case.

The bayonet-shaped sharp elevators (Fig. 20A) are designed to start the saparation of the mucosa from Killian's incision in the front of the nostril. The other sharp elevator, "old model," is also described as used merely to begin the resection in front. It is long and straight and could be used deep in the nares, but its edge, as well as that of the bayonet-shaped separators, is thick, flat on one side and so rounded on the other that it could only be used for scraping and not for cutting, a type of edge I abandoned with the use of Ingals' spud. Killian has no keen-bladed instrument for sharp dissection with its front end (tip), as his little knife (Fig. 21) cuts only from its side, while even my half-round bladed knife (Fig. 12 D), has its edge carried over its back, and the round-bladed knife (Fig. 12 E), and sharp elevator (Fig. 12 L), may be also used for this purpose. Cutting with the front end of the knife is needed in dissecting out the anterior inferior portion of the cartilage from its free border and in liberating adherent places in the hollow of the concavity.

An objection to Killian's and White's instruments is the use of an angular attachment of the handle to the shank, the so-called nasal angle, designed to keep the hand below the level of the nose under the supposition that it gets in the way of sight when holding a straight instrument. Mine are all made straight, yet I can always see the field of operation perfectly. Even slight pressure against the distal end of an angu-

lar instrument tends to rotate the handle, which therefore has to be held firmly, either in the fingers, or, as is easiest, grasped in the whole hand. This effort implies a stiff wrist and fingers, and makes it necessary to make the motions of the instrument with the coarse muscles of the arm and shoulder instead of the finer ones of the hand and fingers, which are capable of more accurate and controlled work. Straight instruments can be held lightly and easily while at work, as their motion is direct and the muscles that move them are those of the hand and fingers. The presence of an angle also complicates the movements needed and disturbs the sense of direction.

The Separation of the Mucosa on the Convex Side.—In order to reach the deepest parts of the nares my spatulae or elevators (Fig. 12, L. M) have been lengthened since their last description.

The mucous membrane and perichondrium of the septum, as I have found them, form two distinct layers. The perichondrium is thin and transparent and is readily overlooked because the whiteness of the cartilage shines through it, and the inexperienced operator, therefore, not seeing it, imagines that he has a surface of bare cartilage before him, and so, instead of lifting the perichondrium from the cartilage, a task of easy performance, is apt to attempt to liberate the mucosa from the perichondrium, a feat impossible for dull instruments and difficult for sharp ones. Killian emphasizes this point well. It is therefore necessary to search for the beginning of this thin film of perichondrium at the edges of the incisions, gently scraping it up with the dulled separator until the instrument will pass underneath it, when the mucosa may usually be readily lifted off with it. Nevertheless there are places where the perichondrium or periosteum clings to cartilage or bone, and here the dulled instrument is laid aside for a moment and a sharp dissector used until the elevation with the dulled spatula may be resumed.

In the double-angled deflections the anterior flap should be reflected in this way, a little beyond the limits of the deflection, so that it will fold back and stay out of the way.

The pocket of mucous membrane behind the vertical angle is made next by undermining perichondrium and periosteum over the entire area of the deflection, backward, and, if possible, downward to the base of the septum. The separation

upwards and backwards is usually very easy, but along the
crest of and below the horizontal angle of deflection, keen
dissection with the sharp spatula is often required and the
elevation of the mucosa may be so difficult that it may even
have to be deferred until removal of the cartilage makes the
bony deviation more accessible.

In the crest-like deflections an upper flap is made following
the incisions described. It should be large enough to fold
upward as much out of the way as possible. The separation
is then continued below the horizontal crest, a mucous mem-
brane pocket being created which reaches the base of the sep-
tum, the crista incisiva and vomer being thus bared below the
horizontal angle. (Fig. 14.) As stated, sharp dissection is
often needed in this region.

In the deep-seated crest-like deflections described the sepa-
ration is readily conducted from the vertical incision recom-
mended, for in these cases there is no anterior deviation to re-
sect first.

In the anterior deflections that require dissection from the
free border of the quadrangular cartilage in the naris of the
concavity, keen dissection with the round-bladed knife (Fig.
12 E) is sometimes needed for a distance back of about one-
half to three-quarters of an inch before dull separation be-
comes possible.

In the usual double-angled type of deviation even
when the deflection has a very acute, prominent ver-
tical angle pressing into the inferior turbinal, there is no
trouble in lifting off the mucosa back of it with my thin curved
spatula, which follows around the angle from the vertical
incision along its summit. Killian says that "the sharp-
angled, traumatic deviations of the cartilago quad-
rangularis create especial difficulty and that whoever
attempts to separate the mucosa around these cor-
ners will perforate, as a rule." This is true of his
operation from an incision in front of the deflection,
but the difficulty is obviated by my vertical cut along the ver-
tical angle.

The First Cut Through the Cartilage.—Killian makes his
first cut through the cartilage with his sharp-edged elevator,
"scratching the cartilage in the direction of the mucous mem-
brane cut and trying slowly to work through it." The in-
strument is applied in nearly a sagittal direction, while the little

finger guards the mucosa in the other nostril. Mueller also scratches through the cartilage. Zarniko uses a gouge. As Menzel dissects from the free border, he does not need to cut through the cartilage.

A clean cut through the cartilage with my thin-bladed, razor-edged knife (Fig. 12 D) is less apt to perforate the mucous membrane of the concavity than tedious scratching through with a thick-edged, sharp instrument, for the keen knife cuts with slight strokes and is held lightly, like a pen, in relaxed fingers, while it is necessary to hold the thick-bladed instrument more firmly and to make pressure on the septum with it in order to make it cut, hence it is liable to suddenly plunge through the mucosa of the concavity when the cartilage is pierced. The light stroke used in cutting with a thin blade permits a delicate sense of touch which tells the operator when he has penetrated the cartilage. For this reason I have abandoned the use of the little finger in the other nostril to feel for the edge of the knife under the mucosa, for this divides the attention. When the knife seems to have severed the cartilage along a line of about one-half an inch the cut edge is felt for with a dull spatula, lifted up, and seized with delicate, rat-toothed forceps (Fig. 22), which pull upon it, while the penetrating cut is finished with the severed edge of cartilage in plain view as a guide. I always operate with the right hand, no matter in which nostril the deflection is, and I do not agree with Killian that "he who wishes to always operate upon the convex side, that is, at one time in the left and again in the right nostril, must be able to use the knife and elevatorium with the left as well as with the right hand."

Before making the first cartilaginous incision in the common double-angled deflections the anterior flap is held out of the way with the retractor, which holds the nostril open, or with a fine double tenaculum. The first cut through the cartilage is then made as formerly, along the entire base of the reflected anterior flap. (Fig. 23.) In the region below the level of the anterior angle of the quadrangular cartilage, that is, below the upper boundary of the alae nasi, the incision may be made at the very front of the cartilage, if the deflection extend so far in front. Above this boundary, where the quadrangular cartilage underlies the lateral cartilages of the external nose, the incision should leave a distance of at least

one-half a centimeter, about a quarter of an inch, between it
and the under surface of the nasal bridge, in order to furnish
the support for the external nose demanded by Mueller and
Menzel.

In making the first cut the blade is not held at a right angle
to the surface, but is slightly inclined away from the oper-
ator. This makes an oblique cut into which the spatula is
readily inserted for lifting up the cartilage. I no longer con-
duct the whole of the elevation of the mucosa of the concave
side through a single anterior incision in the cartilage, but
merely free a small strip of the cartilage back of the in-
cision, working the spatula downward on the concave side
until I reach the base of the septum. The Ingals' cartilage
knife is then introduced into the small space created under
the cartilage, its point is turned away from the mucosa of the
concavity and a small horizontal incision is made through
the cartilage along its base towards the front. This produces
a small angular cartilaginous flap, which gives more room for
freeing the mucosa of the concavity than the single cut does.
(Fig. 23 AA.)

The rarer crest-like deflections usually begin deeper in the
naris than those with double angle. The first incision in the
cartilage in these is made vertically in the plane septum, just
in front of the beginning of the deflection. (Fig. 14 E.) This
plan is adhered to even where the deflection is wholly osseous,
the cartilage being undermined until the bone is reached. If
desired, a small anterior flap can be made to cover the site
of the first cut.

The Separation of the Mucosa on the Concave Side.—The
separation of the mucosa of the concavity may be watched
from the nostril of the convexity or of the concavity of the
deflection. In the latter case the motions of the instruments
may be plainly seen under the covering of the septum. The
little angular cartilage flap just described gives such a free
approach to the parts underneath the cartilage that I now al-
most always look into the naris of the convexity while con-
ducting the separation of the opposite mucosa, only occasion-
ally glancing into the other to see that no perforation has
occurred and that the hollow of the concavity is becoming
effaced.

As Killian states, the elevation of the mucosa of the con-
cavity, if strictly superichondrial, is usually easy and it may
cavity, if strictly subperichondrial, is usually easy and it may

generally be conducted with the dulled separator. But he also speaks of adhesions in deep grooves and depressions. In my experience not infrequently a rapidly progressing, manifestly subperichondrial elevation is unexpectedly checked by an area of firm cohesion between the perichondrium and periosteum and the cartilage or bone, so that a dull separator would punch through, progress becoming impossible except by dissection with the sharp spatula. The separation is also apt to be tedious where the concavity forms a very deep hollow whose curved walls are hard to follow with the separators.

Where Killian encounters adherent areas he advises waiting to release them until a good-sized piece of cartilage is resected to give access to them. This is a good method where the area of adhesion is large or inaccessible. Usually I finish the separation in one act, dissecting off the adherent places. While the elevation of the mucosa of the concavity progresses the rat-toothed forceps pull aside the freed portion of cartilage. In separating the perichondrium the curve of the spatula should look towards the cartilage in order to keep the end of the instrument upon its surface. The most difficult separation is usually found below the deepest pit or trough of the concavity, on the side of the vomer or crista, and the separation of the periosteum from here may have to be deferred until the resection of the cartilage gives better access.

The separation of the concave side is not finished until the mucous membrane hangs away from the hollow of the deflection and the septum looks straight in the nostril of the concavity.

The Resection of the Cartilage.—Before cutting away the cartilage the operator must be sure that it is entirely bared of its coverings on both sides, lest a piece of mucosa be torn out with it when it is removed.

Since my earliest operations, as described in my first paper (*The Correction of Deflections of the Nasal Septum, with a Minimum of Traumatism, Journal of the A. M. A.,* March 8, 1902), in March, 1902, I have usually succeeded in removing all, or the greater part of the cartilaginous deflection in one piece. I have never had to change the method of doing this.

The bared cartilage is pulled outward with the rat-toothed forceps while Ingals' cartilage knife (Fig. 12 H) is introduced underneath it to the back of the pocket of mucosa on the concave side of the deflection. Its point is directed towards

the convex side and its back towards the mucosa of the concavity. It is then made to prick through the cartilage at the bottom and hindmost part of the cartilaginous deflection, and its blade is then drawn forward, cutting through the bottom of the cartilage along its whole length, from the concave towards the convex side, and severing the cartilaginous deflection below. To cut through it at the back an angular cartilage knife is chosen whose edge looks downward when its point is directed away from the concavity. This knife is also passed to the bottom of the mucous membrane pocket of the concavity underneath the cartilage (Fig. 24), its point turned away from the concavity, made to prick through the cartilage at the highest point in the rear of the cartilaginous deflection, and the blade is then made to sweep downward, severing the cartilage at the back. The other of the pair of angular cartilage knives is now inserted into the slit made by the first one, the handle depressed and the blade made to sweep forward, cutting through the cartilage above. The piece being now severed at all of its boundaries is readily drawn out of the nostril.

I regard the exsection of the cartilaginous deflection as one of the simplest acts of the whole performance. If the cartilage be thick, repeated strokes of the knives instead of one will finally cut through it, but for very thick cartilage I have an extra pair of longer angular blades (Fig. 12, F, G.) They are very seldom needed and a convenience rather than a necessity. The whole maneuver is done with the aid of vision and under the intelligent guidance of the hand, so that one can exactly outline the piece to be removed. Remaining vestiges of the cartilaginous deflection may be pared off strip by strip with the angular knives, the sharp separator or Ingals' knife, and I rarely now use cutting forceps on the cartilage.

In distinction to this method Killian uses a forked cartilage knife (Fig. 25), with a little blade between the tines of the fork, designed to cut horizontally from in front. This knife is pushed backward, the cartilage entering the space between the tines of the fork as the knife advances into it. In this manner a cut is made at the bottom and top of the deflecton. The piece between these incisions is then "removed with dressing forceps ("Kornzange")." It is to be inferred from this that its posterior attachment is torn away. This is not exact surgery, for the tough cartilage is apt to tear through

in an unwished for place, so that one may remove too little or too much, and so tear out unseparated mucosa behind. I quote Killian literally: "Das Instrument wird in der Weise verwandt, dass man das zu resezierende Knorpelstueck zuerst oben, dann unten in der Richtung von vorn nach hinten durchscheidet und dann das zwischenliegende Stueck mit der Kornzange entfernt." Killian says that the distance between the tines of his fork "corresponds to the thickness of the cartilage of the septum." This distance, as I have measured it, is three-thirty-seconds of an inch. In sixteen of my cases the cartilage was either uniformly or in places one-eighth to five-sixteenths of an inch thick, and in these it could not have been made to enter a fork whose tines were three-thirty-seconds of an inch apart, so that the advance of the knife in these cases would have been impossible.

W. L. Ballenger has greatly improved Killian's knife by making the blade moveable on a swivel joint, so that no matter what the position of the fork the edge of the knife is always in advance. (Fig. 26.) In this way he can cut above and behind and thus remove a piece in one process.

Ballenger's knife, though it has the tines of the fork three-sixteenths of an inch apart, has a blade no wider than Killian's, about three-thirty-seconds of an inch, and it would therefore also be useless where the septum is thicker than this. If the blade be made wider the tines of the fork must also be further apart, and Ballenger did not find this practical. His fork necessarily projects beyond the seat of the knife, so that an excess of separation of the mucosa is needed behind to make room for this in cutting upward, and a strip of bared cartilage, therefore, remains attached posteriorly. In an instance that has come to the author's knowledge the cartilage was so thick that it pried the advancing fork open, causng the blade to drop out, showing that cartilage may be encountered that it too thick for even Ballenger's broad fork. Barring these objections, Ballenger's knife is undoubtedly serviceable, but I can see no need of a substitute for my simple knives, whose fixed blades are more accurately guided than a swinging swivel blade between the tines of a fork. Besides, my knives can cut any thickness of cartilage encountered.

White and Menzel remove the cartilage piecemeal with cutting forceps. Mueller cuts above and below with scissors

and breaks out the pieces with dressing forceps. The first method is needlessly tedious and the second rough surgery.

The Resection of Bony Deflections.—The Instrumentarium.— The punch forceps, according to my experience, removes bony deflections with more accuracy and less pain than any other instrument. A forceps designed for the resection of the bone should be slender, so as not to obstruct the view and to move freely in the cavity of the naris; the part in front of the lock should be straight and at least three and one-half inches (nine centimeters) long, for bone may have to be cut at a distance of two and one-half to three inches from the front of the nostril and a little length to spare is needed. The jaws should hinge on a rivet at the end of the forceps, so that they will separate widely in a small space and so that the opening of the instrument will not obstruct the view, as it does when the jaws are moved on the rivet of the lock of the forceps. The forceps should be of the "punch" variety, one jaw fitting within the other instead of merely having its cutting edge applied to that of its fellow, as this latter type of instrument will not cut bone, unless it be made so heavy that it blocks the nostril. In spite of the qualities of length and slenderness, the instrument should be so strong that it will easily cut through the thickest and hardest bone found in the septum.

The Gruenwald forceps, which I have used for years, possesses these qualities to perfection, except the last. For bone was occasionally met with which this forceps, strong as it is, could not cut through, or only after the jaws were repeatedly closed upon it. I have therefore strengthened Gruenwald's forceps by giving it a forceps handle instead of a scissors handle, and by other changes, so that I now have an instrument that will cut through the heaviest bone in the septum, even the crista and anterior end of the vomer with a moderate pressure of the hand. The slenderness and length of the forceps has been preserved and the jaws open laterally instead of vertically, as in the original, adapting the instrument still better for the septum. The blades are made only partly fenestrated, a ledge remaining designed to preserve the strength of the blade and to retain the exsected pieces and keep them from falling out in the nose. My modified forcep (Fraenkel's Archiv fuer Laryngologie, Vol. 17, page 172), like Gruenwald's, is made in three sizes. (Fig. 27.) The operator needs the

middle and smallest sizes. The large one is an occasional convenience.

Killian employs Hartmann's punch forceps. (Fig. 28.) This does not nearly equal Gruenwald's in strength, for its rivet is too weak and the distance from it to the end of the blades is too long. It is too light to be reliable for cutting bone and would break easily.

The Jansen-Middleton forceps (Fig. 29), has been lately recommended for the operation. It is powerful, yet, on account of its spoon-shaped blades, whose edges merely meet instead of fitting into each other, it cannot make a clean cut in bone. Hajek (Fig. 30) has adapted the punch and die system to this same forceps and his modification does cut bone. Both patterns of forceps, however, are only fairly slender for one and one-half inches back of the cutting end, behind this the broad, square sockets of the joints make them too large to enter the nostril, hence they cannot be employed deep in the naris.

White states that the distance from the lock to the ends of the cutting blades of his forceps (Fig. 31), which is of the Hartmann ronguer pattern, and is not a punch but a spoon-bladed one, is seven centimeters, but not more than five centimeters of this length is available, because of the strong curve of the blades, whose massiveness unfits them for work in a narrow cavity.

In addition to punch forceps, a chisel or gouge (Fig. 12 N, O, P) is required for the removal of the deflected crista and anterior end of the vomer.

Killian employs a strong bayonet-shaped gouge, the distance from the cutting end to the bayonet angle being one and one-quarter inches, so that the instrument could only be used an inch back of the anterior nasal spine. (Fig. 32.)

The saw is not suited to the operation and most authors do not mention it.

Scissors only cut to advantage horizontally in the nose and the bone of the septum is too strong for them in most places.

I have employed the dental motor and trephine but three times in my last 67 operations. I restrict it to cases where there is need of removal of the anterior plane of a thick vertical deflection far back in the vomer (Figs. 6 and 7). Such obstructions lie across the naris like a wall and are hard to grasp with forceps. The trephine I use is unguarded, one

and three-quarter inches long and its diameter is three and
one-sixteenth inches.

The Removal of the Bone.—The bony part of the operation
receives such slight mention from most authors and the means
described for its performance are so inadequate that the in-
ference is natural that it is frequently not thoroughly done.
Yet it is often the most difficult act of the resection and un-
less all vestiges of the bony deviation be removed a half result
is likely to occur for which the surgeon will always feel apolo-
getic.

In most bony deflections, in looking directly backward in
the naris of the convexity, after completion of the resection
of the cartilage, one sees the steep superior border of the
vomer joined above, at an angle caused by the deflection, by
the anterior inferior border of the perpendicular plate or, more
often, by a remnant of cartilage which is the posterior angle
of the quadrangular cartilage. The angle of deflection men-
tioned is the horizontal angle in vertical section and appears
like a V lying upon its side (Fig. 33), and it is this V and
the parts back of it that are to be resected posteriorly. Looking
downward at the floor of the nose the continuation of the su-
perior border of the vomer forward and the crista are seen,
freed of cartilage, the vomer and crista curling over towards
the naris of the convexity, sometimes so strongly that they lie
nearly flat on the nasal floor, making the surface belonging
to the concave side look upward and simulate the bottom of
the naris.

The bony resection begins with the extirpation of the pos-
terior V mentioned. The operator should assure himself be-
forehand that the bone is completely freed from its covering
on both sides. It is easy to avoid injuring the liberated mu-
cosa and no long speculum is needed in my operation to hold
the mucous sacks open; at the most the spatula is required
to lift away the mucosa of the convexity; that of the con-
cavity hangs away. The forceps is now introduced, its jaws
slipped as far onto the bone as possible, piece after piece bitten
out and the V followed upward and backward until completely
removed, even if it extends to the posterior end of the vomer.
Where in an extreme deflecton the V crowds firmly against
the inferior turbinate it is sometimes difficult to wedge into
the fissure so created even the blade of the forceps, not
to speak of using a speculum blade in addition. I do not

see how Killian can cut bony deflections of this nature between the blades of his long speculum. In these very difficult deflections one cannot always save all of the posterior part of the mucosa of the convexity. The operator should not let the wish to preserve it or the fear of a possible perforation keep him away from a thorough resection of the bone, for the loss of some of the mucosa or the occurrence of a perforation far back in the naris is of little consequence, while an imperfect result is a great disappointment.

After the resection of the V posteriorly the curved-over maxillary crest and front of the vomer, on the nasal floor, next need removal. They should be reinspected to see whether they are denuded of their covering, for the separation of the mucosa over these bony parts has very often to be put off until the last, because of the difficulty of its removal. It is commonly firmly adherent, because, as Killian states, the front end of the vomer and the crista are enveloped in their own periosteum, which therefore covers their upper border after the cartilage has been resected from it. This periosteum is continuous with and has the same color as the perichondrium lining the inner surface of the mucosa of the concavity, so that no boundary is visible where this is reflected onto the bone and the edge of the bone can, therefore, not be seen, but must be felt for and cut down on with the round-edged knife. The bone is then dissected out from its coverings by keen dissection, with the sharp spatula and the knife A (Fig. 12), which is designed to release it on the concave side. The periosteum in this region is usually too adherent to be scraped away.

When the anterior end of the vomer and the crista stand bare, they may be cut away with my forceps if they project enough to be seized with it. If not, the chisel is applied in front and driven back as far as the bone is deviated, with light taps of a small mallet. Killian then advises to lift the chisel and to break off the severed strip behind. This is an excellent method. It is also proper in this locality, and this only, to twist off with dressing forceps the posterior attachment of the fragment partly detached with the chisel, for no harm can come from doing this so near the nasal floor.

The chisel is only suited to the strong, well supported base of the vomer and crista, and should not be used higher up on the septum, as it is liable to shiver the frail and brittle bone

in these regions and create far-reaching fissures.

Breaking out of pieces of bone by twisting with forceps is also to be avoided, except in the one place mentioned, for the same reasons. It causes great pain and the result of the violence may be fracture in distant places.

When the resection seems complete an attempt should be made to smooth down the flaps on the septum. If remnants of the deviation exist above or below, the mucous membrane will not lie down and the projecting bone or cartilage must be trimmed off until it does.

The concave side should also be inspected to see whether the hollow be effaced.

Killian directs the operator to cut away the thin part of the vomer and lamina perpendicularis with the Hartmann forceps above the crest and then, with the same instrument, to resect the vomer below it, behind the part cut away with the gouge. The crest of the deflection he then breaks out with forceps, after it is thus freed above and below. I agree with Killian that the bone above the crest is usually thin, but am not in accord with his statement that "the vomer below a deviation and crest is always very thin." On the contrary, I have found the vomer below the horizontal crest of deflection so often strong and massive that I regard thickness and not thinness of this part as typical. (Fig. 34.) I do not think the weak Hartmann forceps could have cut the bone I encountered in many cases. To break out the strong angle of the bony deviation from its often frail and brittle setting behind, after it has been freed above and below, as Killian does, is inexact surgery, would be very painful and might lead to fractures in the lamina perpendicularis reaching far beyond the intended break.

Mueller outlines a tongue of cartilage and bone above and below with scissors and with dressing forceps twists out the deviation in one piece or several fragments; a primitive and painful method that includes the danger mentioned.

Suturing.—Killian says that, as a rule, he no longer sews and he only recommends sutures if a perforation through both layers of the mucosa in the same place has occurred.

White has a special pair of alligator needle holders and sews his flap with them in about ten minutes.

Krieg and Mueller, of course, do not sew, as they remove the mucosa of the convexity.

Zarniko has ceased to sew and Weil depends on the tampon, as I do, to retain the flap in place.

I regard sutures as unnecessary. White and Menzel are, therefore, the only ones who make suturing a regular step of the operation, and I think that in time it will disappear from it, except for the purpose indicated by Killian. For sewing, in the deeper parts of the naris, Killian employs a needle (Fig. 35 A), bent at an acute angle on the end of a long stem, attached to a handle. The threaded needle is passed through both edges of the wound in the mucosa, from before backward, the edges being steadied with forceps. The thread is then caught with a minute hook (Fig. 35 B), and the needle pulled out, leaving the thread in place. It is then tied with the aid of dressing forceps.

The Tamponade.—Mueller and Zarniko permit the patient to go home without packing the nostril; all of the other authors use a tampon.

I have always packed the naris in all my cases and, nevertheless, twice, merely because I tamponed too loosely, I have had severe delayed hemorrhage occur about two hours after the operation. I regard it as dangerous to dismiss a patient unless the naris be evenly plugged on the operated side, and on both, if there has been a perforation.

Killian always plugs both sides. I regard this as a needless discomfort to the patient.

I still use sterilized lint, impregnated with subnitrate of bismuth, for my tampon, and in no case (even when the plug has been in the nose a week) has it ever become offensive. Bismuth is far superior to iodoform as an antiseptic in these cases.

I no longer pack with one long strip, but introduce the lint in successive layers. It is cut in ribbons one-quarter on an inch wide and eight to ten inches long. Before packing the nose the flaps are smoothed down into place with a small swab, and readily adhere. I have long discarded the use of a metal guard to protect the wound while packing, as it prevents the even filling of the naris and leaves the tampon loose when the guard is withdrawn.

To begin the packing a strip is folded in its middle, the ends being held between the thumb and index finger of the left hand, while the right pushes the end of a stiff nasal probe, such as Gruenwald's, against the bottom of the fold, to hold

the strip taut. (Fig. 36.) It may also be stretched by the thumb and fingers of the same hand that holds the probe. The strip, stretched in this manner, is passed in along the nasal floor to a little beyond the posterior end of the window. It is then pressed down on the nasal floor with the probe. If the resection of a crest-like deflection has left an inferior flap or pocket of mucosa, it is to be supported by the strip. In the same manner successive strips are then introduced (Fig. 37), one above the other, until the nose is nearly full, the ends of those in the naris being held against the upper lip with the ring finger of the left hand, while the next strip is passed in. As the tampon builds up it sustains the flaps so that they cannot become displaced. They are not always redundant enough to meet exactly at their edges, but a small raw surface left by their retraction is of no moment. The last strip is longer than the others, and is tucked in on top in successive little folds, as was done in my older method of packing, completing the filling of the naris.

This packing may be relied upon to prevent hemorrhage, but an hour or two after the operation, no matter how completely the naris be stuffed, a watery, free, mucous discharge, tinged with blood, usually sets in and is caused by the relaxation of the vessels constricted by adrenalin and cocain. If the patient be not warned of this discharge he is apt to think that his nose is bleeding and in his alarm to needlessly disturb the surgeon.

The removal of the packing is begun on the second day after the operation by withdrawing the top strip and as much of the others as will pull out easily and without bleeding. When all hold fast or when a few drops of blood appear, the removal of the rest is deferred until the next day. In the average case the tampon is out by the third or fourth day. The parallel situation of the strips prevents excessive bulging of the mucosa over the window into the naris of the concavity.

The patient needs to stay in bed only on the day of the operation. After that he may be up and about, but should not go to work for a week.

The after treatment is simple. For the first ten days the naris is kept closed with a pledget of cotton, to exclude dust and keep the secretions moist. After this the patient may use the naris for respiration, is told to spray it out with normal salt solution and insert a little plug of wet cotton in the nos-

tril for a few hours whenever needed to soften dried secretion. In addition an ointment of salicylic acid, ten grains to six drams of lanolin and two drams of vaselin is swabbed into the nasal vestibule by the patient to prevent hardened mucus from adhering. After four to six weeks the nose needs no further treatment.

During the first two to three weeks after the operation the soft parts of the septum are somewhat swollen, so that the patient has not the free breathing he obtains later, nasal respiration continuously improving until after six weeks the naris becomes ideally clear.

A review of the literature of the subject of the window resection has shown me that each author has created his own methods, with little heed for what others have done, so that to the novice the already large list of ways of doing the operation must be bewildering. Comparison of methods and custom will in time evolve an operation of classic uniformity and it is to be presumed that the best will survive.

Suckstorff, in his brief history of the window-resection, says that "through Killian's modification, the sub-mucous resection has been elevated to a height that should satisfy all reasonable demands." Neither Killian's views, instrumentarium or methods seem to me so faultless that they deserve this praise. His statement that he does the operation in the average time of twenty minutes sounds rather like quick than careful surgery. I quote literally from Killian's article: "Zur Vornahme der ganzen Operation brauche ich im Durchschnitt 20 Minuten." The minimum time that I need for a purely cartilaginous deflection is twenty minutes, but the average time for my operations is at least three-quarters of an hour to an hour, for in the 60 per cent. of my cases more or less difficult bony deflections needed removal. An average time of twenty minutes for me would mean that my purely cartilaginous deviations were resected in about five minutes, or else that I did not extirpate the bony deviations completely. It may be urged that Killian is a rapid operator, and that his method saves time. As to the method, if I had to resect the numerous massive, deep-seated, prolonged bony deviations that I have met, by means of a buttonhole incision in front, a long speculum to obstruct the entrance of the naris, the weak Hartmann forceps, Killian's short gouge and a dressing forceps, I should take much longer than I do now. Granting that Killian is

the speediest of operators, he can not so far outstrip all others that he can do in an average of twenty minutes what other operators of great experience admit has the one fault of a tedious operation. The depth and narrowness of the field in the bony operation, the strained vision needed to see to slip the blades of the forceps over the edge of the bone, the difficulty of wedging a blade between marked deviations and the inferior turbinate, the need of frequent wiping, as a drop of blood obscures the remote, contracted field, these are all factors that make the bony operation necessarily prolonged if it is to be well done by any operator.

Conclusions.—1. The appearance of deflections does not divide them naturally into two great groups with distinct aspect, one obviously traumatic and the other due to faulty growth, as is taught by Killian. To consider etiology in this way in the description of deflections is merely confusing and it is better, as heretofore, to group them according to their shape.

2. The window resection is adapted to children, but the chance of a possible recurrence from the effects of growth demands a very complete removal of the vestiges of the deflection.

3. The firmness, and, therefore, probably the cartilage and bone of the septum, is completely or nearly completely reproduced in the window after the resection.

4. Cases seen two and one-half years after the operation show permanency of the result.

5. Though the author has never seen a case of sinkng in of the nasal bridge after the window resection, Mueller's and Menzel's warning should be heeded to retain a strip of the cartilage of the septum under the lateral cartilages of the external nose.

6. The lower portion of the quadrangular cartilage, as high as the level of the alae nasi, may be resected without fear, from its anterior inferior free border horizontally back to the bone.

7. The recumbent position of the patient is the best for the operation, except in operating along the nasal floor.

8. The Kirstein light is the most suitable one.

9. The use of powdered cocain, applied with a swab, gives a perfect and safe local anesthesia and the submucous injec-

tion of cocain is needless, except at the very front of the septum.

10. The best access to a deflection for its resection is obtained by mucous membrane incisions along its vertical and horizontal crests, and not by means of a buttonhole cut in front of it, such as is made by Killian and others.

11. The separators used for the elevation of the mucosa should be thin, curved, and either dulled or knife-edged for dissection.

12. The presence of a nasal angle in an instrument complicates its movements, and makes it necessary to hold it with a stiff wrist and fingers, thus sacrificing the lightness and accuracy of motion of straight instruments.

13. It is better to make the first cut through the cartilage with a keen, thin, round-bladed knife than with a thicker sharp-edge that scratches through.

14. Even if strictly subperichondrial, the elevation of the mucosa is apt to encounter adherent places that need separation by keen dissection.

15. The cutting out of the denuded cartilage in one piece is the easiest part of my operation.

16. With the exception of fragments, cut with the chisel from the crista incisiva or anterior end of the vomer, neither cartilage nor bone should ever be broken, twisted or torn from its attachment, but should always be cleanly cut away.

17. The author's modification of Gruenwald's punch forceps has proven the best instrument he has used for resecting the bone, as it is slender and long, and yet easily cuts through the thickest bone encountered.

18. There is a tendency to hasty and incomplete removal of the bony part of the deflection.

19. Sewing is needless.

20. Srtips of lint, impregnated with subnitrate of bismuth, make the best tampon. The author introduces the strips in layers, as described, so that the flaps are perfectly held in place.

21. Considering the many difficult bony resections met with, the author does not think that the operation can be well done in the average time of twenty minutes, the estimated time of Killian.

Fig. 1. Deflection showing vertical angle. From life.

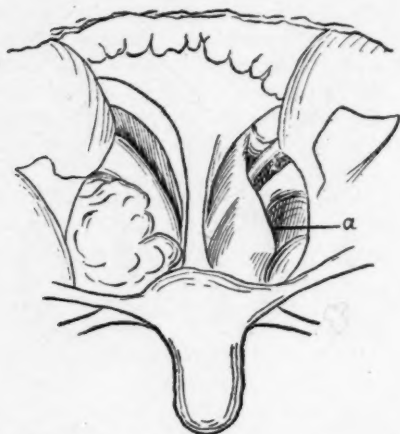Fig. 2. Deflection showing vertical angle. From life.

Fig. 3.   Posterior view of a bony deflection.   From life.   a, deflection.

Fig. 4.   View of a deflection of the posterior end of the vomer. a, deflection.   b, intumescent inferior turbinate.   From life.
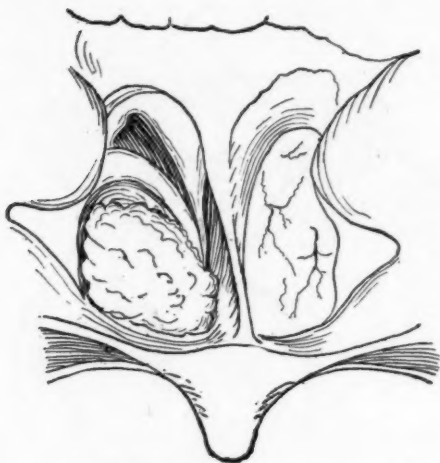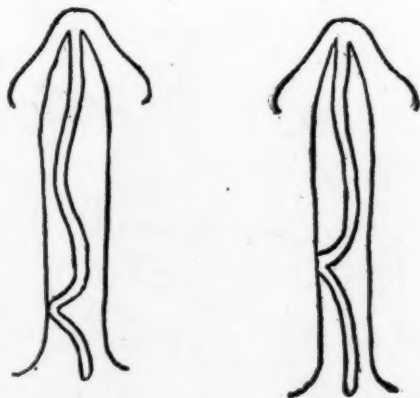
Fig. 5. View of a deflection of the posterior end of the vomer.
Congenital atresia of the left choana. From life.

Figs. 6 and 7. Horizontal section of septum showing sharp
vertical deflection of vomer.

Fig. 8. Greatly thickened anterior inferior free border of the quadrangular cartilage lying beside the septum cutaneum. a, cartilage. From life.
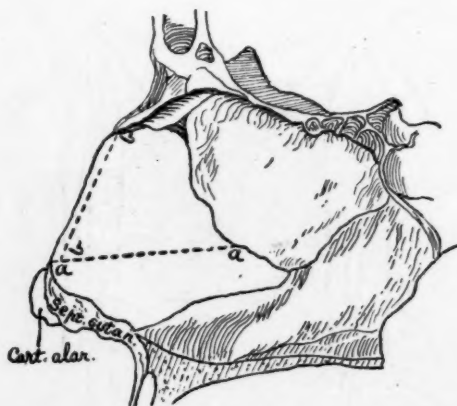
Fig. 9. The nasal septum. aa, line below which the cartilage may be completely removed. bb, posterior limit of strip of cartilage under nasal bridge to be preserved.

Fig. 10.   Kirstein headlamp.

Fig. 11.   Edison stereopticon electric light.
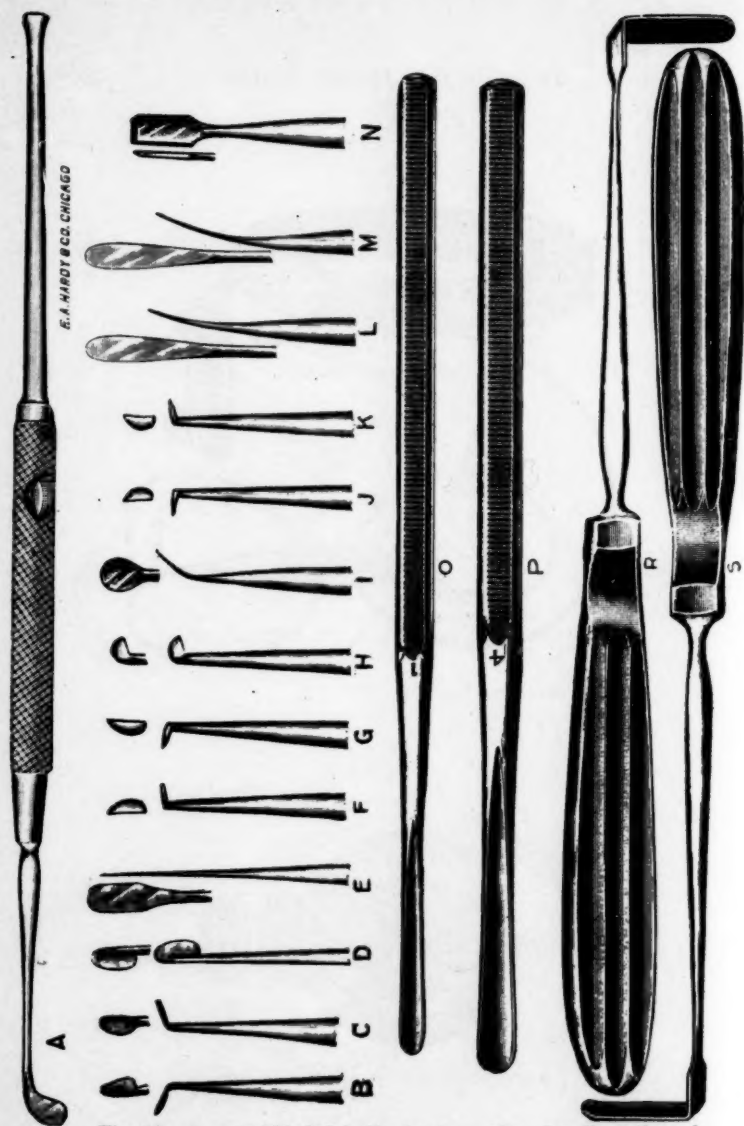
Fig. 12.   A, round-bladed knife, bent on edge, for dissection of mucous membrane from concave side of bony base of deflection. B and C, halfround-bladed angular knives for vertical incision in mucous membrane when deflection is far back; D, half-round-bladed straight knife for vertical incision in mucous membrane when the deflection is nearer the front and for first cut in the cartilage; E, flat, round-bladed dissecting knife; I, angular, round-bladed knife; F, G, J and K, sharp-pointed, angular cartilage knives for cutting through back and upper part of cartilaginous deflection; H, Ingals' submucous cartilage knife; M, dull-edged elevator for uplifting of mucosa; L, sharp-edged elevator for dissecting up mucosa in adherent places; N, chisel; O, P, gouges; R, S, retractors for holding nostril open.
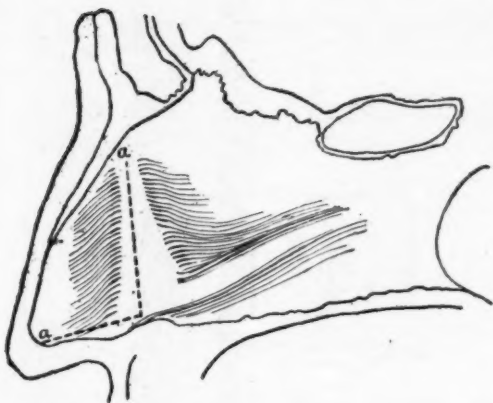
Fig. 13.   Lateral view of convexity of double-angled deflection.
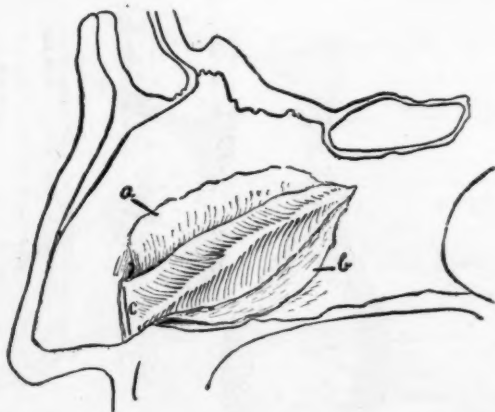a a, outline of mucous membrane incision.

Fig. 14.   Lateral view of convexity of crest-shaped deflection.
a, superior flap; b, mucous membrane pouch formed below; c, first
cut through cartilage in front of deflection.

Fig. 15. Deflection showing vertical angle in left naris and dislocation of free border of cartilage into naris of concavity. Dotted line shows site of mucous membrane incisions.

Fig. 16. Killian's long specula for rhinoscopia media.

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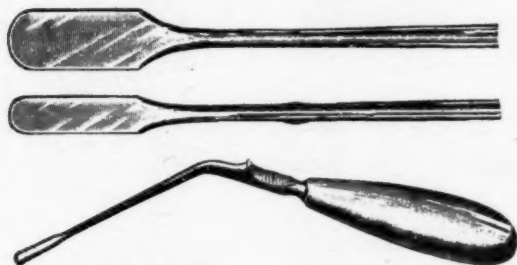Fig. 17. Hajek's elevators; blunt and sharp.   Natural size.

Fig. 18.   White's separators.

a

b

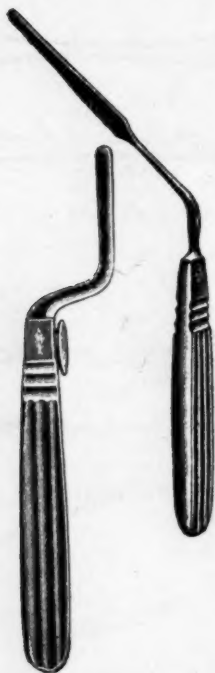Fig. 19.   Killian's blunt elevators. a, straight; b, curved.

Fig. 20.   One of Killian's right and left bayonet shaped, sharp elevators; old model sharp elevator.

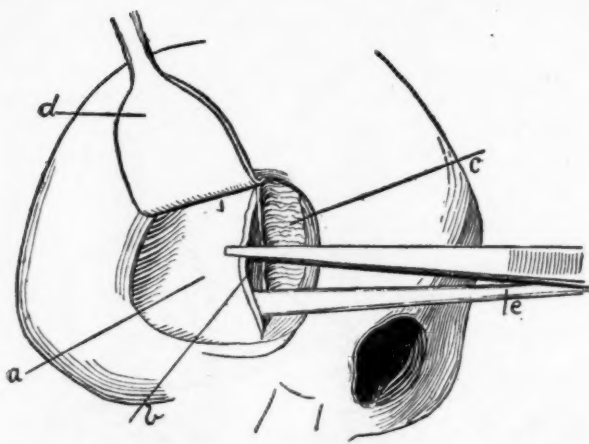Fig. 21.   Killian's septum knife.

Fig. 22.   Denuded deflection in the right naris seen somewhat from the side.   The posterior edge of the slit in the cartilage is held with the rat-toothed forceps after it has been lifted up with the elevator.   a, cartilaginous deflection; b, inner surface of the mucosa of the concavity; c, anterior flap; d, retractor lifting the wing of the nose; e, elevator underneath the cartilage.
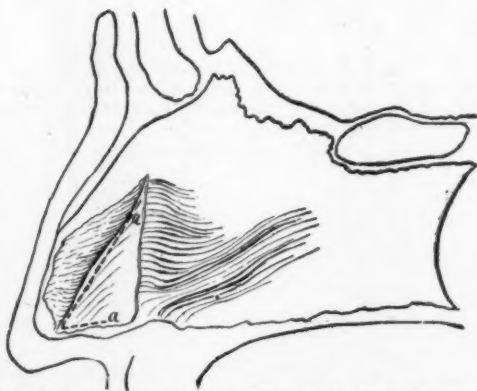

Fig. 23.   Lateral view of the septum; a a, first incisions in cartilage outlining a, tongue-like flap.
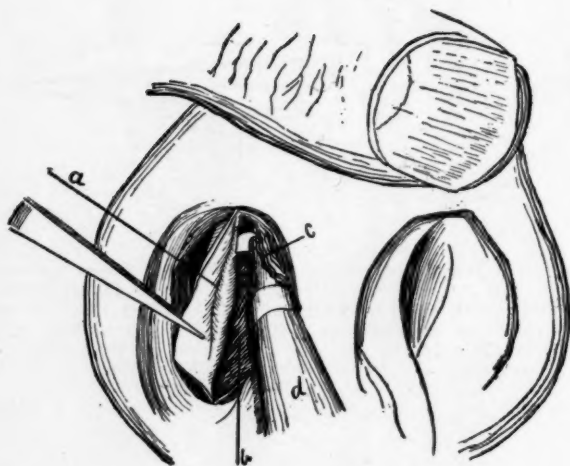
Fig. 24.   The cartilaginous deflection, including the vertical
angle a, has been cut through at its base and in front and is being
severed behind and above by the angular cartilage knives; b, inner
surface of the mucosa of the concavity of the deflection; c, anterior
flap folded out of the way; d, angular cartilage knife.

Fig. 26. Ballenger's swivel cartilage knife.

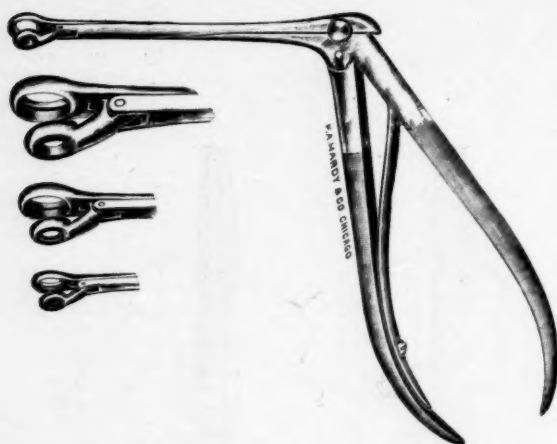Fig. 25. Killian's forked cartilage knife.

Fig. 27. Freer's modified Gruenwald forceps.

Fig. 28. Hartmann's punch forceps.

Fig. 29. Jansen-Middleton forceps.

Fig. 30. Hajek's modification of the Jansen-Middleton forceps.

Fig. 31. White's forceps.

Fig. 32. Killian' gouge.
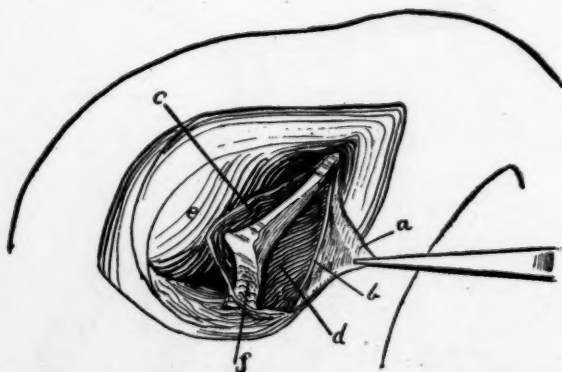
Fig. 33. V-shaped profile of bony deflection seen after removal of cartilaginous deviation; a, anterior flap; b, anterior cut edge of cartilage; c, separated mucosa of convexity of deflection; d, inner surface of mucosa of concavity of deflection; e, inferior turbinate; f, vomer.

Fig. 34. Vertical profile of some of the bony deflections encountered showing thick vomer.

Fig. 35. Killian's needle, a, b, fine hook to catch thread.

Fig. 36. Strip of bismuth lint pulled taut against end of probe for introduction.

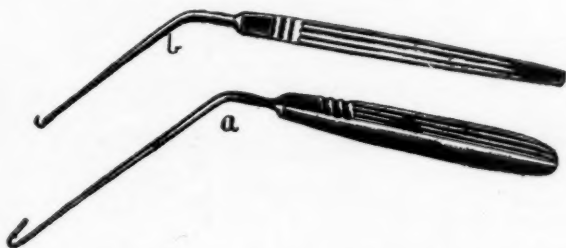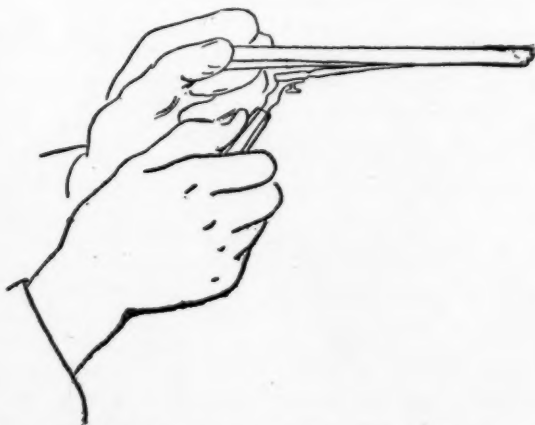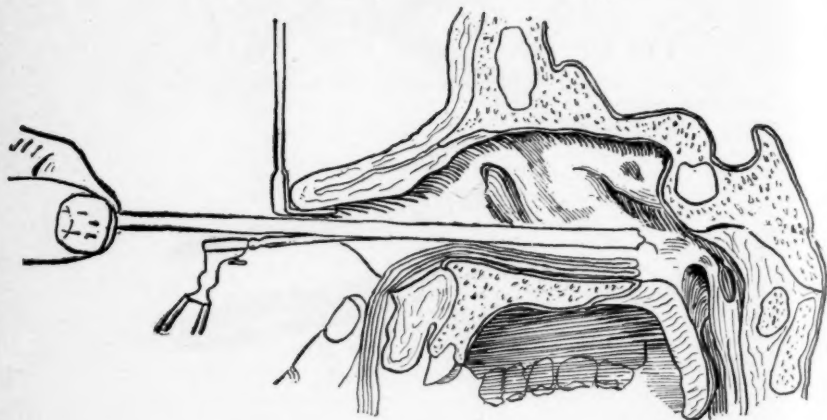Fig. 37.   Lateral view of nasal fossa.   Two folded strips of the tampon lie in the naris, the loose ends being held with the finger against the upper lip.   A third strip is being introduced stretched against the end of a probe.

THE NOSE AND ITS ACCESSORY SINUSES IN THE AMERICAN BEAR.

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A study of the nose and its accessory sinuses in different animals shows that these structures are comparatively simple ones in macrosmatic animals (animals which do not have an acute sense of smell), but in microsmatic animals (animals which have an acute sense of smell), the nose and its sinuses are highly specialized and developed. A good example of this remarkable development is found in the nasal organ of the American bear.

The bear's nose is a very complicated organ of respiration and olfaction, and may be considered as a fair type of the nose in carnivorous animals. These animals in their wild state obtain their food, for the most part, by being able to find it through their acute sense of smell and frequently it is necessary for them to pursue their prey, so that both the respiratory and olfactory functions of the nose play an important part in the maintenance of their existence and hence are especially well developed.

The anterior half of the bear's nose is used almost exclusively for respiratory purposes; the posterior half is divided into a respiratory portion and an olfactory portion. The septum is a thin plate of bone and cartilage situated in the median line, as in man. From each side of the vomer, a thin shelf-like plate of bone (Plates I and II, Figure 1) extends laterally across each fossa, subdividing the posterior part of each fossa into two superimposed cavities. The superior cavity is the larger one of the two, contains almost all of the ethmoidal turbinals (Plates I and II, Figures 2, 3, 4, 5 and 6) and forms

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the greater part of the olfactory portion of the nose. The
inferior cavity (Plates I, II and III, Figure 7) is a round,
tube-like structure leading directly backward from the max-
illary turbinal to the naso-pharynx (Plate I, Figures 8 and 9)
and is used simply for respiratory purposes. The maxillary
turbinal is a very complicated structure situated in the anterior
part of the nose (Plates I and IV, Figure 8). It springs from
a broad base attached to the superior maxillary bone. From
this base, numerous branching processes are given off which
form an 'intricate labyrinth, almost completely filling the an-
terior third of each nasal fossa.

The ethmoidal turbinals are exceedingly complex structures.
There are five in each fossa, which radiate from the convex
surface of the cribriform plate of the ethmoidal bone (Plates
I and II, Figures 2, 3, 4, 5, and 6). Each ethmoidal turbinal
consists of a mass of delicate wavy plates subdividing into
almost innumerable branches which intertwine with each other
and form a dense labyrinth. This labyrinth is lined through-
out by a mucous membrane in which the numerous branches
of the olfactory nerves are distributed and thus a tremendous
expanse of olfactory mucous membrane is contained within
a comparatively small space. The distribution of the olfactory
nerves over such a large area makes the bear's sense of smell
correspondingly acute. *Some of the numerous branches of the
ethmoidal turbinals extend into each of the accessory cavities
of the nose, and so in the bear's nose, the accessory sinuses
all contain some olfactory turbinal structures and are a part
of the olfactory portion of the nose.*

The superior ethmoidal turbinal (which corresponds to the
middle turbinal in man) is the largest of the ethmoidal turbi-
nals, and one of its processes, extending anteriorly, overlaps
the maxillary turbinal throughout its entire length. All of the
ethmoidal cells are formed by some of the numerous branches
of this turbinal uniting with each other or with the surround-
ing bones of the skull (Plates I, II, III, and IV, Figure 11).
There are five well developed ethmoidal cells, in each lateral
half of the skull, all of which contain some branches of the
ethmoidal turbinal.

The maxillary sinus is hollowed out of the superior maxil-
lary bone   (Plates III and IV, Figure 12). It begins just
behind the posterior end of the maxillary turbinal and in-
creases in size as it extends backward. The ostium maxillare

is a large irregularly oval opening extending downward almost
to the floor of the cavity, which is considerably above the
floor of the nose (Plate I, Figure 13). This sinus has prac-
tically no roof, for one large ethmoidal cell opens directly into
it, being only partially separated from it by a lateral process
of the superior ethmoidal turbinal (Plate III, Figure 6).

The hiatus semilunaris (Plate III, Figure 14), is a well
defined groove in the ethmoidal turbinal leading directly from
the frontal and ethmoidal cells into the maxillary sinus, so
that these cells all drain into the maxillary sinus and thence
directly into the nose, for the ostium of this sinus extends
down to its floor.

There are two frontal sinuses in each lateral half of the
skull (Plates I and II, Figure 15), separated from each other
in the median line by a thin bony septum. The ostia of the
frontal sinuses are in the inferior part of each of the cavities
and small processes of the superior ethmoidal turbinal extend
through them into the sinuses.

There is one sphenoidal sinus in each half of the skull
(Plate I, Figure 16). The partition between them is somewhat
irregular but it is situated about in the median line. From
the posterior superior part of each sinus, a diverticulum ex-
tends laterally into the lesser wing of the sphenoidal bone.
The ostium sphenoidalis is large and through it one of the
ethmoidal turbinals projects directly into the cavity (Plate I,
Figure 2).

Considering the bear's nose as a whole, it is an exceedingly
highly developed organ. The turbinals are all very complex
structures and the ethmoidal or olfactory turbinals are es-
pecially well developed.

The accessory sinuses are comparatively large and all con-
tain ethmoidal turbinal tissue. They form a series of cavities
extending over the external surface of the ethmoidal turbi-
nals, and some of the cavities in each lateral half of the skull
communicate with each other, but not with those of the op-
posite half of the skull. Their function seems to be to provide
space for the tremendous development of the ethmoidal tur-
binals, to conduct air over the external surface of these struc-
tures and to furnish a system of drainage for them.

Comparing the nose and its accessory sinuses in man, with
similar structures in the bear, we find that in man the tur-
binals have all degenerated (or reverted) into comparatively

simple structures. The number of the ethmoidal turbinals
has decreased from five to two, but rudiments of the third,
fourth and fifth ethmoidal turbinals are frequently seen in the
embryo and sometimes in the adult. The relative position
of the turbinals has changed owing to the tremendous de-
velopment of the fore-brain and the consequent change in
position of the bones in the anterior part of the skull. The
relation of the cranium to the nasal cavity has also changed,
for the cranium, in man, has enlarged so that it is situated

PLATE I.

Longitudinal section through a bear's skull, showing the left
nasal fossa.

1—Lateral wing of vomer.

2, 3, 4, 5 and 6 designate the five ethmoidal turbinals, situated
in the olfactory portion of the nose.

7—Part of the respiratory portion of the nose, separated from
the olfactory portion by the lateral wing of the vomer.

8—Maxillary turbinal.

9—Nasopharynx.

10—Cribriform plate of the ethmoidal bone.

11—Ethmoidal cells.

13—Ostium maxillare, partially covered by the ethmoidal
turbinal.

15—Frontal sinuses.

16—Sphenoidal sinus.

17—Brain cavity.

19—Palate.

directly over the nose instead of being posterior to the nose,
as it is in the bear.

The accessory sinuses, in man, no longer contain any of the ethmoidal turbinal tructures, but rudiments of these structures are occasionally found in some of the sinuses. The sinuses themselves, are almost completely shut off from the nose by the contraction of their ostia and their functional activity is lost. Therefore, the accessory sinuses of the nose in man, seem to be simply rudimentary structures.

PLATE II.

Transverse section through the posterior part of the right half of a bear's nose, looking posteriorly.

1—Lateral wing of vomer.
4, 5, 6—Ethmoidal turbinals.
7—Posterior part of the respiratory portion of the nose.
11—Ethmoidal cells.
15—Frontal sinuses.
17—Brain cavity.
18—Orbit.
19—Palate.

PLATE III.

Transverse section through the median portion of the right half of a bear's nose, looking posteriorly.

6—A portion of the ethmoidal turbinal forming an incomplete partition between one large ethmoidal cell (11) and the maxillary sinus (12). Just posterior to this lateral process of the ethmoidal turbinal, these two sinuses unite and form one large cavity.

7—Respiratory portion of the nose.

11—Ethmoidal cells.

12—Maxillary sinus.

14—Hiatus semilunaris.

18—Orbit.

19—Palate.

PLATE IV.

Transverse section through the right half of a bear's nose, just posterior to the maxillary turbinal, looking anteriorly.

6—Ethmoidal turbinal.

8—Maxillary turbinal.

11—Ethmoidal cells.

12—Maxillary sinus.

19—Palate.

STRICTURE OF THE EUSTACHIAN TUBE IN AURAL DISEASES, AND ITS TREATMENT.*

By W. Sohier Bryant, M. D.,

NEW YORK.

Stricture of the Eustachian tube is a reduction of the normal lumen of the tube, causing more or less obstruction. It may be organic or purely functional. When the stricture is tight it cannot be overlooked; when the obstruction is slight, the deviation from the normal tube is not apparent without careful tests. Though the presence of tubal obstruction is of very great importance, its full significance, unfortunately, is rarely appreciated.

The slightest obstruction causes the following evil results only in a less degree than a tight stricture:

I. Imperfect ventilation of the tympanum, causing either too little or too great barometric pressure in this wonderful chamber. The many baneful consequences resulting are (1) passive congestion, (2) over extension, or over flexion of the membrane, ossicular chain, and stapedio-fenestral articulation, any one of which destroys the acoustic balance, (3) irritation of the sensory and sympathetic nerve endings, (4) changes in nutrition, and (5) indirect effects on the labyrinth.

II. Imperfect drainage of the tympanum. Septic infection and absorption of septic material result; also clogging and over distention of the sound conducting apparatus from internal exudations.

III. Reflex congestion and edema of the mucosa and contents of the tympanum.

IV. Other reflex disturbances, often elusive, but nevertheless very important. An example of such disturbances is a

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considerable loss of hearing released by the flow of air through the tube, where a total destruction of the drum membrane has occurred.

Strictures can be classified as acute and chronic; suppurative and non-suppurative. In this paper, I shall consider only the chronic non-suppurative group, which includes the larger majority of obstinate cases of impaired hearing and tinnitus, particularly those found in the omnibus of chronic middle ear catarrh.

Pathology.—A series of many hundred post-mortem examinations, which I made at the Harvard Medical School during the ten years between 1887 and 1897, failed to show a single case of organic stricture of the Eustachian tube, except in those of the suppurative class. In such cases, the stricture never occurred near the isthmus, but at the extremities of the tube. I therefore conclude that organic strictures of the isthmus are very rare; that organic strictures seldom if ever occur in any part of the Eustachian tube in non-suppurative conditions, and that the large number of strictures seen in practice are purely functional.

The pathology of the variety of stricture under consideration is passive congestion or edema. This is sometimes combined with slight paresis of the tubal muscles and with adhesions. An examination of the patients shows in most cases the presence of more than one of these conditions. Occasionally tenacious mucus will be found occluding the tube. Attempts at inflation, with oscultation, will locate the stricture in the most vascular part of the tube, namely, the cartilaginous portion. This part also has the largest amount of areolar tissue. The nature of the sound given as the air passes does not suggest an annular, but a tubular narrowing more or less extensive.

Etiology.—There are two varieties of these strictures, (1) circulatory, due (a) to the faulty composition of the blood, and (b) to faulty circulation; (2) mechanical, due to impaired muscular action brought about (a) from some defect in the muscles, and (b) from mechanical interference with their action. In most cases, these conditions are combined in varying proportions. The predisposing causes of functional strictures are gout, syphilis, faulty general circulation, cardiac or arterial; hypertrophy and new growth in or about the naso-pharynx, adhesions and cicatrices of naso-pharynx, usually in

the fossa of Rosenmueller; mouth breathing, and rhino-pharyngitis.

The *Diagnosis* of organic stricture is made by a series of tests of permeability, by the use of compressed air. When no air can be forced through the Eustachian tube, bougies can be used, but on account of the many normal obstructions to the passage of a bougie, for instance the folds of mucous membrane of the pharyngeal part of the tube, the abnormal lateral narrowing of the osseous tube, and the occasional presence of bone spiculæ at the typmpanic mouth of the tube,—the results must be interpreted with considerable caution. Whether a catheter with high air pressure would not show permeability in some of the cases where the finest bougie could not be passed into the tympanum is a question to be determined. I think it must be decided in the affirmative. It is well known that some cases, impermeable to the bougie, allow a flow of air without any great difficulty. Where the permeability of the tube is interfered with, the diagnosis of functional stricture should be accepted until the presence of organic stricture is demonstrated.

Test of permeability.—The nares must be clear enough to allow a flow of air, and the naso-pharynx must not be obstructed with thick mucus. While the patient is inflating the ear by Valsalva's method, the effect on the membrana tympani must be observed through the speculum. The readiness with which the air passes into the drum, and the ease of its reflux must also be noted. Normally, air should enter the tympanum on very slight intra-nasal pressure, and the excess of distention should disappear spontaneously when the intra-nasal pressure is exhausted. Any retardation in the inflation or reflux shows a stricture of the Eustachian tube. Its tightness is proportionate to the retardation of influx and reflux. Great care must be taken that the patient's head is not bent toward the ear under examination, for a certain amount of obstruction to the flow of air is normally caused by the compression due to flexion of the neck.

If the result of Valsalva's method of inflation is 0, then Politzer's method is tried, and if necessary, the catheter. Before air can be made to enter the tympanum, it may be necessary in some cases to increase the pressure through the catheter to 50 pounds. It is not wise to use more force. The degree of pressure required to overcome the stricture is a direct index

of its firmness and narrowness. The nearness or distance of the auscultatory sounds indicates the position of the stricture. The higher pitched the sound, the tighter the stricture. The smoother the sound, the smoother and clearer the walls of the stricture.

Both before and after attempts at inflation, the membrana tympani must always be inspected; much may be learned from its changed appearance. Only in this way can the presence of impeded reflux be known, because the resistance offered to the entrance of air is often no indication of the resistance offered to its exit. When air enters with difficulty, but escapes readily, the inference is that the stricture acts like a valve. Air sometimes passes into the typanum in such small volume that it gives no auscultatory sound, its flow being indicated only by the evident signs of tympanic distention.

TREATMENT.

Since 1887 the treatment of these cases has received my special attention. Very many of them were treated successfully without the employment of any method of inflation.

In 1888, Dr. Spear called my attention to the intimate connection of the lower turbinate with the function of hearing. Since that time the examination and treatment of a large number of cases in Boston and New York has shown me that this auditory region of the nose extends backwards to the fossa of Rosenmueller and surrounds the Eustachian tube.

To emphasize a method of treatment which I have found successful in all the cases that have come under my care during the last two years, I will consider more particularly the treatment of functional stricture in which the constitutional disturbances are not great, and the naso-pharyngeal conditions are not sufficient to attract the cupidity of the rhinologist.

The treatment that I most rely upon at present is the application of adrenalin and solution of silver nitrate to the auditory regions of the nose and naso-pharynx. The cases treated in this way have shown, without exception, marked improvement in the calibre of their Eustachian tubes. Except once, in the case of an old lady, where too profuse an application of nitrate of silver solution caused a laryngeal irritation lasting a few hours, I have never had an acute inflammation excited, or any accident result from the treatment.

There are many well recognized methods of treatment which are serviceable under various conditions. *Constitutional treatment* requires attention to gout, syphilis, faulty cardiac and arterial circulation. *Nasal treatment* requires surgical removal of impediments to free nasal respiration. *Pharyngeal treatment* requires surgical removal of new growths or extensive hypertrophies, and the breaking down of adhesions. *Local treatment* may be given by bougies, electric and medicated; by Politzer's method of inflation and the catheter, with or without vapors; by injections into the tube, and by massage, and applications of reagents to the mouth of the tube and its neighborhood. The best of these reagents is nitrate of silver.

PROGNOSIS.

I find that, in the very large class of cases under consideration, the Eustachian tube has invariably responded to a persistent course of treatment and that no evil effects have resulted in any case.

Case 1. Miss B., a school teacher, aged 42, referred by Dr. Clarence J. Blake, of Boston. She complained of a long standing gradually increasing difficulty in hearing, and occasional tinnitus, which interfered with her profession. At the time of her first visit, Sept 10th, the nasal fossae were clear, and the mucous membrane was dark red. The drum membranes were slightly retracted, of good color, with small light reflexes. No air would enter by Valsalva's method, or that of Politzer. As only a little air entered the tympanum with great difficulty by the catheter, the presence of a tight functional stricture of the tube was apparent. A solution of nitrate of silver was applied to the naso-pharynx, and an alkaline spray used at home.

Seven days later, the result of Valsalva inflation was zero, and that from Politzer's method very small. By catheter, the inflation was still very imperfect on the right side. Sept. 24th, the patient said her ears were better. A little air entered by Valsalva's method, more by the catheter; but the light reflexes were still imperfect. Before inflation, the watch was heard on the left at a distance of 45 inches; on the right, at a distance of 22 inches. Applications of adrenalin and silver nitrate solution were made to the naso-pharynx.

On Oct. 3rd, Valsalva's method of inflation was successful

for both ears. The presence of supernumerary light reflexes which persisted after swallowing, showed that the reflex was still imperfect. Before inflation, the watch was heard at the left, 47 inches away; at the right, 30 inches away. After inflation, the watch was heard at a distance of 37 inches. Oct. 15th, the watch was heard at the left, 60 inches away; at the right, 40 inches away. The patient felt much better. Valsalva inflation was easy for both ears, but best in the left.

On her ninth visit, Oct. 21st, the Valsalva inflation was good and equal. Oct. 28th, the drum membranes looked well. The light reflexes were good. The patient thought her ears were in a good enough condition to stop the treatment. On Jan. 3d she wrote: "Except for a fortnight, when I was unfortunate enough to be suffering from a heavy cold, my ears have remained in a very good condition. Now that the cold has disappeared, the ears seem normal again."

Case 2.—Mrs. L., 64 years, complained of impairment of hearing and tinnitus in both ears. In the left, where the trouble had begun three years before, she had at the time of her first visit, Dec. 12th, a constant roaring like the sound of a waterfall. This roaring was occasionally intermingled with sharper sounds. Inspection showed that the right drum membrane was drawn in, and dark-colored. The light reflex was very faint. In the left ear, the drum membrane had good color and a fair light reflex. The watch was heard on the right, 9 inches away; on the left, 22 inches away. The fact that Politzer's method of inflation could not inflate the right ear showed the presence of a functional stricture of medium grade. Applications of adrenalin and solution of silver nitrate to the pharynx were made.

Dec. 14th, the watch was heard on the right, at a distance of 12 inches; on the left, a distance of 20 inches. Inflation was easy by Politzer's method. Dec. 19th, the watch was heard on the right, 17 inches away; on the left 29 inches away. The same treatment was continued. Dec. 23d, the watch was heard at the left, 54 inches away; at the right, 48 inches away. The tinnitus was very faint.

Case 3.—Rev. J., age 26, complained of impaired hearing of late in his left ear, and slight ringing tinnitus. His first visit was made Oct. 25th. An examination showed that the bone conduction was much increased and that the air conduction was diminished. By air, the high notes were well

heard, but the hearing was defective for the low notes. The tuning fork was lateralized to the left. The left membrana tympani was marked by whitish atrophic areas on a clear background. Imperfect Valsalva inflation demonstrated the presence of a slight functional stricture. Treatment was given by applications of a solution of silver nitrate to the naso-pharynx.

Nov. 11th, the watch was heard at the left, 72 inches away (normal 62 inches). Applications of adrenalin and solution of silver nitrate were made to the naso-pharynx. On his seventh visit, Nov. 18th, the patient was well pleased with his improvement. The watch was heard at the left, 96 inches away. Valsalva inflation was easy in both ears. The hearing of the watch at the right was normal. On his ninth visit, Dec. 23d, the watch was heard at the left 360 inches away. Since that time, diminished hearing or tinnitus has not disturbed the patient.

Case 4.—Mr. B., aged 43, complained of impaired hearing and slight tinnitus in right ear, lasting several years. On his first visit, June 25th, the right drum membrane was retracted, the color good, the light reflex very faint. Air would not pass by the Valsalva method; by the Politzer method it entered with great difficulty. This showed the presence of a functional stricture of medium grade. Before inflation, the watch was heard at a distance of 1½ inches; after inflation, at a distance of 24 inches. Treatment was given by applications of a solution of nitrate of silver to the naso-pharynx.

July 1st, the watch, before inflation, was heard 24 inches away; after inflation, 3 feet away. Applications of adrenalin and solution of silver nitrate were made to the naso-pharynx. July 8th, the watch, before inflation, was heard 4½ feet away. On his fourth visit, July 22d, the patient was much improved. The watch was heard at a distance of 18 feet.

Case 5.—Mr. L., aged 24, complained of decreased hearing and tinnitus on the right side. He was referred to me with the diagnosis of commencing stapes fixation. He used to have crackling and some musical tinnitus, but now he has only buzzing and a sound like surf. His first visit was made Oct. 21st. The right drum membrane was slightly drawn in, its color and surface normal, the light reflexes broken. As inflation was imperfect by the Valsalva method, the presence of a functional stricture of at least medium grade was shown.

The acoumeter was heard at a distance of 12 inches. A solution of silver nitrate was applied to the pharynx.

Oct. 28th, the nasal mucous membrane was dark red. Valsalva inflation was imperfect. Treatment was given by applications of adrenalin and solution of silver nitrate. The patient said that for three days after the last visit he heard better, but that the tinnitus was less. Oct. 31st, there was less surf sound in the ear. The acoumeter was heard 4 feet away. Dec. 12th, the acoumeter was heard at a distance of 8 feet. Valsalva inflation went for the first time, but with great difficulty. Adrenalin and silver nitrate solution were applied to the nasopharynx. On his eleventh visit, Dec. 20th, tinnitus was hardly perceptible. Valsalva inflation was occasionally normal. The acoumeter was heard at a distance of 7 feet on the right, and the watch at a distance of 6 inches. By the left ear the watch was heard 4 feet away.

Case 6.—Mr. M., aged 41, came to me with a long history of impaired hearing and much treatment. Many years ago he had suffered from suppuration in the left ear. Since an exposure to a loud whistle blast, the hearing in the left ear had been much worse. In the right ear, buzzing tinnitus was present.

His first visit was made July 1st. The left drum appeared atrophic or scarred in several places. The right membrane was sunken, but otherwise normal in appearance. By Poltzer's method of inflation, the air passed very poorly in the left ear, but went better by the catheter. This fact suggested functional stricture of the pharyngeal end of the tube. The air entered more readily into the right ear. On the left, the acoumeter was heard 3 inches away. After inflation, it was heard at a distance of 9 inches. Treatment was given by applications of adrenalin and solution of silver nitrate to the naso-pharynx.

On his fourth visit, the watch was heard by the right ear 17 inches away; after inflation, it was heard at a distance of 27 inches. By the left ear, the acoumeter was heard 3 inches away. On Jan. 24th, his fifth visit was made. Before inflation, the watch was heard by the right ear 38 inches away. By the left ear, the acoumeter was heard 48 inches away. The permeability of the tubes was much improved, but not yet perfectly normal.

Conclusions: The foregoing cases, I believe, justify the following important conclusions:

1. The stricture of the Eustachian tube in aural diseases is not generally organic.

2. Non-organic strictures are easily treated by the methods employed.

XVII.

COLLODION; ITS USE WHEN THE MEMBRANA TYMPANI AND MALLEAL LIGAMENTS ARE RELAXED.*

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NEW YORK.

Since the publication of McKeown's classical paper, "The application of simple collodion to the membrana tympani in the treatment of various diseases of the ear," (British Medical Journal, 1879, page 1013), very little has been added to the experiences which he relates. He reports two typical cases of uneven depression of the drum membrane behind the malleus which bulge after inflation. These show marked improvement in hearing after the application of collodion. McKeown goes on to say that he has used collodion with good results in some cases of adhesion of the malleus and drum membrane,—indrawn drum membrane,—irregular depressed drum membrane, —and membranes that flapped on inflation. Improvement followed in most cases. He has noted one untoward result, an instance of rupture of the drum membrane by the collodion.

Chevanne in La Presse Oto-Laryngological Belgique, 1904, page 416, reports a case of spontaneous rupture of the drum membrane in acute otitis, several months after the application of the collodion. The symptoms were doubtless aggravated by the increased resistance offered by the collodion which still remained in the ear.

Instigated by Dr. C. J. Blake I have tried contractile collodion in two classes of cases.

Class I. Relaxed posterior upper segment of the membrana tympani, a very common condition.

Class II. Laxity of the malleal ligaments, especially with the malleo-incudo-tympanic.

In both classes of cases some benefit was noted.

The etiology in both conditions is similar, and they may be found co-existing. Class I is a very numerous one since its etiological factor is still often operative though not so much so as formerly. Class II is much more rare. Both classes of cases are due to over inflation and usually follow over treatment. But the same condition may also be brought about by the patient inflating the tympanum during frequent and forcible acts of blowing the nose.

When the drum membrane is naturally weak, or when the reflux of air through the Eustachian tube after inflation is much interfered with, the too frequent act of inflation will constantly keep too high a pressure on the inner side of the drum membrane, which in time will cause the drum head to yield at its weakest point. When the exciting cause is extremely active the tensor tympani seem to be paralyzed and the malleus is pushed outward with the drum head and finally the ligaments holding these ossicles in place become stretched beyond their power of recovery. Other cases arise when there is very little resistance to the reflux of air offered by the Eustachian tube after inflation, when the poor condition and nutrition of the drum membrane cause it to yield with abnormal ease to the increased intratympanic tension. This laxity interferes more or less markedly with the acoustics balance resulting in a loss of sound transmission, which is still further diminished by the lessening of the sound receptive power of the drum membrane due to a decrease of its vibratory power.

The diagnosis is easily made if the ear is inspected during or immediately after inflation. The changed position of the malleus handle and short process, when they have been moved bodily outward while the ligaments are lax, can be easily recognized, especially if they are under inspection during the act of inflation. The hyper-convexity of the posterior superior quadrant of the drum membrane usually surmounted by a supernumerary light reflex is an indication of the laxity of this portion of the drum membrane. Dr. E. A. Crocket tells me that he has often noted that musicians with this affection are annoyed by perceiving a difference in pitch of a single note, the pitch varying with the ear which perceived it.

ETIOLOGY.

These cases depend for their cause on the over stretching of the fibrous layer of the drum head due

I. To more or less narrowing of the Eustachian tube (stricture).

II. To frequent inflation of the tympanum.

III. To a drum head which is unable to withstand the increased internal tension caused by the impeded reflux of air after inflation.

Inter tympanic vacuum does not appear to be related to the causes of this affliction.

DIAGNOSIS OF CLASS I.

As will be seen, the hearing in these cases is very likely to improve while the drum membrane is kept tense by the act of inflation, the improvement being only momentary or of brief duration. On inflation, the posterior superior segment of the membrane is seen to bulge forward more than the rest of the periphery of this segment. The presence of the supernumerary light reflex is pathognomonic of this lesion of the drum head.

DIAGNOSIS OF CLASS II.

During the act of inflation the whole membrane will be seen to move outward together with the handle and short process of the malleus.

PROGNOSIS.

In most cases where care is used in the application of a collodion splint, the hearing distance is at once increased. In some cases, however, the hearing distance is at first slightly diminished, and does not increase until the collodion has separated from the drum membrane, which may require six or eight weeks or even longer. The tension of the ligament and drum membrane tends slowly to return. If the treatment is continued for a period of from six months to a year, the results are permanent, provided the exciting cause is abolished.

Prognosis of the relaxation when neglected is very bad as long as the exciting cause is operative. The tendency is for the condition to increase. If the exciting cause is removed, the improvement, if any, is extremely slow. When the drum membrane is protected by the collodion, the tension gradually improves, and the length of time required for its entire recovery depends upon its nutrition and the degree of laxity.

TREATMENT.

I. Avoid the exciting cause, inflation.

II. Apply a collodion splint to the relaxed portion of the drum head.

III.   Make the Eustachian tube patulous if it is not already so.

Collodion is painted upon the drum membrane, the area to be covered depending upon the conditions. If the ligaments are relaxed the whole upper half of the drum membrane should be coated. Where the relaxed area is confined to the upper superior segment the collodion should be applied only to this region. The amount of collodion applied should be carefully gauged to avoid seriously inconveniencing the patient or causing any damage to the drum head.

DANGERS.

Discomfort or pain may be due to the contraction of a too abundant application of the collodion. Rupture of the membrane was noted by McKeown. The increased resistance of the membrane due to the collodion may seriously complicate an intercurrent, untreated middle ear inflammation. The increased weight and stiffness of the drum head with the collodion may diminish the hearing temporarily.

Case 1.—Rev. Mr. X, 26 years old, in good health, noted deterioration of hearing in left ear. Upon examination the nose and throat were found normal. The left drum membrane was slightly retracted, and very transparent. He complained of a slight tinnitus and occasionally a buzzing in the ear.

Valsalva inflation was slightly retarded and showed bulging of posterior superior quadrant of the membrane with a supernumerary light reflex on the periphery. Air conduction slightly decreased with some loss of low tones. Bone conduction slightly increased, tuning fork on vertex lateralized to the left. Watch heard at distance of six feet. On application of collodion distance immediately increased to ten feet. Next visit, watch heard at fifteen feet after application of collodion. Third visit, heard watch twenty feet, after further application of collodion heard it thirty feet. Patient was then satisfied, as he heard watch only twenty-five feet with the other ear.

In two months the patient reappeared with same complaint of diminution of hearing in left ear following cold in the head. Heard watch four feet with the left ear, and twenty feet with the right ear. Valsalva inflation slow in both ears and showed over distension of the left drum membrane as before. Complained at this time of a decrease of hearing in right ear as well as the left. Application of collodion increased

hearing in left ear to five feet, another application brought it up to twenty feet.

A month later patient appeared with another cold and the usual symptoms in the left ear. Tuning form strongly lateralized to the left. Left tube abnormally patulous. Valsalva on right was very difficult. Patient said left ear felt clogged but the right one felt like a hole. Collodion applied to the left drum membrane made this ear feel like a hole too, and hearing was increased to thirty-six feet immediately. Since that time patient has retained his normal hearing with the exception of two similar attacks a month apart.

Case 2.—Business man, 41 years old. Patient had previously had treatment many years for the ears and nose. On first examination heard acoumeter six inches in left ear. Heard better during noise. One application of collodion increased distance to thirty-two inches. Drum membrane of left ear showed over distension with supernumerary light reflex on superior posterior quadrant. Valsalva slow, membrana tympani very thin.

Case 3.—Business man, 43 years old. Total deafness in right ear following suppuration. History of long standing deafness in left ear from nose pharyngeal trouble. This case is remarkable on account patient experiencing no tinnitus. Inspection showed the presence of an adhesive process in left ear. The left tube was patulous. Valsalva inflated very easily and reflux of air not interfered with. During the inflation the posterior superior segment of the membrane tympani was seen bulging forward with a light reflex on its convexity. Acoumeter heard at seven inches.

Collodion was applied over the bulging area at intervals for six visits. Hearing improved gradually until the last observation eight weeks after the first one which gave the result of hearing the acoumeter at forty-two inches. Several observations were made previous to the treatment showing that the hearing increased one hundred per cent when the membrane was tense during inflation.

Case 4.—Society lady, came from Dr. C. J. Blake for continuation of treatment instituted by him and returned to him for its completion. The left ear showed relaxation of the drum membrane superiorly and posteriorly, on inflation. There was a supernumerary light reflex along the periphery of the membrana tympani. Air reflux slow. On the eighth of Feb-

ruary patient could hear acoumeter four inches in the left ear. Collodion was applied on four occasions and on March first the acoumeter was heard thirty inches.

Case 5.—Woman stenographer, 32 years old. History of long standing deafness and tinnitus with much treatment. The Eustachian tubes were previously closed, but had been permanently opened by the electric bougie, and at time of my first examination they were perfectly free. Membranes were white but thin, malleus handle slightly retracted, and light reflux small. On Valsalva inflation the upper and posterior parts of the membranes bulged forward carrying the short process of the membranes bulged forward carrying the short process of the malleus with it. The hearing was very much increased during this procedure, but immediately went back to usual distance. The patient was in the habit of inflating her ears to enable her to hear ordinary conversation. Acoumeter was heard twenty-six inches in the right ear. After collodion application it was heard forty-eight inches. In the left ear the acoumeter was heard twenty-three inches. During Valsalva inflation it increased to fifty-four inches. On the relaxation of the tension of the tympanum it immediately fell to the former distance. After the application of collodion it rose to seventy-two inches. This case belongs in Class II because it has relaxed ligaments.

CONCLUSIONS.

When the Eustachian tube is not perfectly patulous there is a possibility of overcoming the natural elasticity of the drum membrane by too frequent inflation, which may even also cause laxity of the ossicular ligaments.

Treatment of this condition by the use of collodion offers an encouraging prognosis.

Untreated the condition has little tendency to spontaneous cure but rather to an increased defect.

XVIII.

MANUEL GARCIA.*

By John W. Farlow, M. D.,

BOSTON.

To-day there was celebrated in London the one hundredth anniversary of one who, still living and active, has well been called the father of laryngology. There is probably no laryngological society in the world which has not sent its letter of congratulation to the distinguished centenarian, Manuel Garcia, in recognition and appreciation of the great service which he rendered to the whole world by his successful laryngoscopic examinations of the larynx, and his paper entitled "Physiological Observations on the Human Voice," which gave such impetus to the examination, diagnosis and treatment of laryngeal disease that speculation and deepest ignorance soon gave way to the science of laryngology.

Let us inquire what his antecedents were, what sort of a man he was and what led him, who was not a medical man, but a singing teacher, to make his experiments on the larynx. According to Chorley, the great English musical critic, the Garcias were a Spanish family of musicians and representative artists whose power, genius and originality have impressed a permanent trace on the records of the methods of vocal execution and ornament. The father of Manuel Garcia[1] was Manuel Garcia del Popolo Vicenti, born in Seville, Spain, in 1775. He began his artistic life at six years of age as chorister at the cathedral, and studied music under the best masters of Seville. At the age of seventeen, he made his debut at Cadiz in an opera of his own composition. Later he went to Italy and studied

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[1]Sir Felix Semon in an article published in the Centralblatt für Laryngologie states that Garcia was not the true family name but was adopted as a stage name. The family name was Rodriguez.

the Italian method. He appeared in opera in Paris in 1808, where he was received with much applause and his style of singing was greatly appreciated. In 1824, he went to London and thence to New York, in 1825, with a company of excellent artists, among them his son, Manuel, and his daughter, Maria, better known under her subsequent name of Malibran, one of the most famous opera singers the world has ever known.
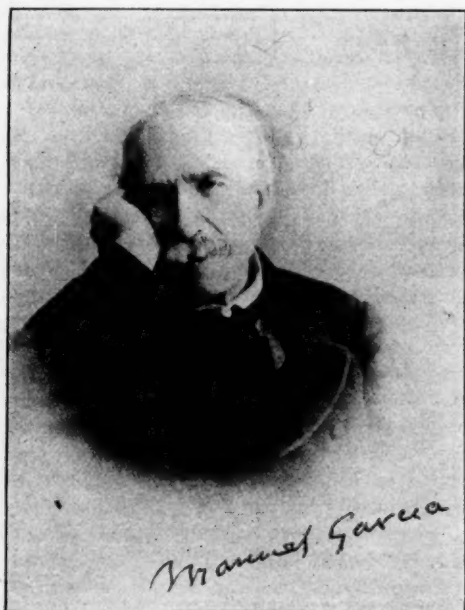
Fig. 1. Manuel Garcia.

They appeared in Italian opera in New York with much success, and later went as far as Mexico. They were on the point of returning to Europe, when he was set upon by brigands, on the way to Vera Cruz, and robbed of his well-earned wealth, about thirty thousand dollars. He had hoped to found an Italian theatre in New York, but the loss of all this money compelled him to return to Paris, where he soon retired from

the stage and devoted himself exclusively to teaching, until
his death in 1832. His method of singing was unsurpassed,
and some of the most celebrated singers were his pupils, among
them his son, Manuel, his daughter, Mme. Malibran, whom I
have already mentioned, and also his daughter, Pauline, Mme.
Viardot, who became very famous as an opera singer. He
wrote excellent treatises on the art of singing.

His son, Manuel, was born in Madrid, March 17, 1805, just
one hundred years ago to-day. He studied music under va-
rious teachers in Madrid and Paris and later under his father.
His lessons were interrupted in 1825, when he was twenty
years old, by his journey to New York with his father's opera
company, in which he sang second bass. After his return to
Europe he gave up the theatre and assisted his father in teach-
ing singing at Paris. He studied seriously the conformation
of the vocal organs, the limits of the different registers of the
voice and the mechanism of the larynx in singing and presented
the subject at the Academy of Science in Paris in 1840, in a
work entitled *"Memoire sur la Voix humaine,"* and received the
congratulations of the Institute for it. He was Professor of
Vocal Music at the Paris Conservatory of Music from 1842
to 1850, and published a book in two parts on singing, for the
use of pupils and especially of teachers, an excellent work
containing many novel ideas. In 1850, he went to London
and became Professor at the Royal Academy of Music. His
wife, whose maiden name was Eugenie Mayer, was one of his
pupils and became a notèd opera singer. He has trained the
voices of many of the most famous artists, among them Jenny
Lind. Of late years he has lived in London and his address
is Mon Abri, Cricklewood, London. We see that he was no
ordinary music teacher. Of a distinguished musical family,
he had been interested in the throat, the larynx and the voice
for many years and had published, as early as 1840, a treatise
on the voice worthy of the commendation of the French Acad-
emy.

Let us look for a few moments at the attempts of the pre-
decessors of Garcia to see the larynx in the living, human sub-
ject. In these days, when the study of laryngology is compul-
sory for a medical degree, and when every student is obliged
to have a fair amount of attainment in the use of the laryngeal
mirror, it seems strange to read, in an article published by
Yearsley in London, in 1862, seven years after Garcia's paper

and four years after Czermak's demonstrations, that he feels
that the subject is such an important one that he hopes there
will be in every large city at least *one* practitioner who is expert
in the use of the laryngoscope.

It is probable that dental mirrors had been used at intervals
from time immemorial for examining the teeth, and polished
tubes for looking into the external canals are of very ancient
origin. Many of you have, doubtless, seen the various specula
unearthed at Pompeii. But it is necessary to have illumination
as well as a reflecting mirror in order to see down into the
larynx, and, as Mackenzie well says, "the fact that it was not
till comparatively recently that physicians attempted to dis-
criminate between diseases of the fauces and those of the wind-
pipe, may account for the non-appearance of the laryngscope
at an earlier date. There is no evidence of a laryngoscope be-
fore the middle of the eighteenth century."

About 1743, M. Levret, a French accoucheur, devised a sort
of speculum to aid him in removing polypi from the nose and
throat by ligatures. It was a plate of polished metal which
reflected the luminous rays in the direction of the tumor and
also received the image of the tumor. This was evidently
merely something to enable him to see how to tie his ligatures,
and he made no real use of it to see the larynx.

Nearly sixty years later, in 1804, Bozzini of Frankfort, Ger-
many, devised a tube for illuminating the various canals of the
body. The title of the book was "The Light-Conductor, or
Description of a Simple Apparatus for Illumination of the
Internal Cavities and Spaces in the Living Body." An absurd
idea was commonly held that the apparatus would permit an
inspection, not only of the outlets of the body, but even the
internal viscera. The medical faculty, particularly that of
Vienna, was down on him for his pretensions and styled his
instrument the "Magic Lantern in the human body."

His invention, of which I show you a drawing, consisted
of two essential parts, first a kind of lantern and second a
number of hollow metal tubes (specula) for introducing into
the various canals of the body. The lantern was vase-shaped,
made of tin, in the center of which was a small wax candle.
In the sides of the lantern were two round holes, a larger
one and a smaller one opposite each other. To the smaller,
an eye piece was fixed, and to the larger the speculum. The
flame of the candle was situated just below the level of these

two apertures. The mouth of the speculum, a tube of polished tin or silver, was always of the same size, but the diameter of the tube beyond the orifice varied according to the size of the
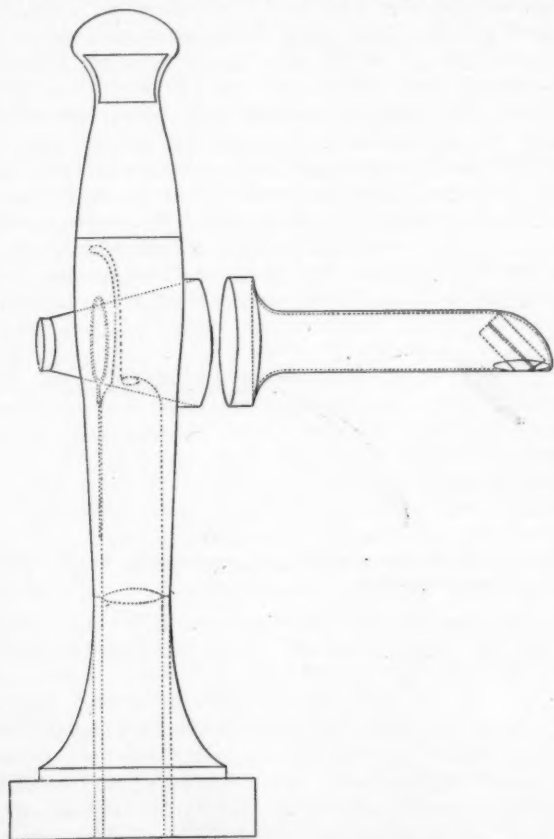
Fig. 2. Laryngoscope of Bozzini, showing the vase-shaped lamp with candle inside. The speculum with the two small mirrors at the bend is to be attached to the larger opening in the side of the lamp. For looking down into the larynx, the small end of the speculum is directed downwards, and it can be turned upward when the post-nasal space is to be examined.

canal into which it had to be introduced. The apparatus was about thirteen inches high and at the downward bend of the

laryngeal tube were two mirrors. In employing reflected light
he had the speculum divided by a vertical partition, so that
there were two canals and two mirrors, one to convey light
and one to receive it.

Later I will give some of the objections to the value of such
tubes in the throat. Suffice to say here, that nothing of value
came from its use in the throat.

In 1827, Dr. Senn, of Geneva, had a little mirror con-
structed for introduction to the back of the pharynx, with
which he tried to see the upper part of the larynx, but he gave
up its use on account of the small size of the instrument.

In 1829, Dr. Benjamin Guy Babington, at a meeting of the
Hunterian Society of London, showed an instrument, not very
unlike the laryngoscope now in use, for examination of the
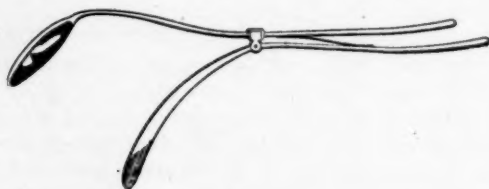parts within the fauces not admitting of inspection by unaided

Fig. 3. Glottiscope of Babington, showing the laryngeal mirror
and the tongue depressor.

.sight. He used two mirrors: one, the smaller, for receiving
the laryngeal image in the throat, and the larger for concen-
trating the solar rays on the first one. The patient sat with
his back to the sun, and, while the illuminating mirror (a com-
mon hand looking-glass) was held in the left hand the laryn-
geal mirror was introduced into the mouth with the right hand.
By a simple mechanism, a tongue depressor was united with
the laryngeal mirror and thereby one of the most serious ob-
stacles to laryngoscopy was attempted to be overcome. A
spring was fixed between the shank of the laryngeal mirror
and the spatula in such a way that by pressing the two handles
together the tongue was depressed. At a later period he gave
up the combination of mirror and spatula and had mirrors
made which resembled those now in use. They were of pol-
ished steel inclined to the shank at an agle of about 120°.
Though he used his mirrors on many patients, there are no

cases recorded in which it was employed. He made a decided advance over Senn, who used merely a laryngeal mirror and no mirror for throwing in light. The difference between Dr. Babington's glottiscope, as he called it, and the one now in use is that, while in the latter the light is thrown on the laryngeal mirror by a circular mirror attached to the forehead of the operator, in the former the illuminating was effected by a mirror held in the operator's left hand and also no artificial light was used.

In 1832, Dr. Bennati, of Paris, asserted his ability to see the vocal cords. A mechanic named Selligue, who was suffering from tubercular laryngitis, had invented a double-tubed speculum, of which one tube served to carry the light to the glottis, and the other to bring back to the eye the image of the glottis reflected in the mirror placed at the pharyngeal end of the tube, and his larynx was examined and treated by Bennati by means of this apparatus.

Trousseau, the great French clinician, had a similar tube made for himself, but found it of very little value, as not more than one patient in ten could tolerate it. He says, "it is of such a size that it fills up the space between the free edge of the soft palate and the tongue. It causes gagging, retching and closure of the pharynx, which prevents a view of the parts lower down," and he asserts that "Bennati is in error in saying that he has seen the glottis with the speculum of Selligue. He saw only the upper part of the epiglottis and very rarely the superior entrance of the larynx and that only when the accidental straightening out of the epiglottis permitted." Trousseau recommends, instead, a digital examination of the larynx, which shows what he thought of specula.

In 1838, Baumes showed at the Medical Society of Lyons a mirror about the size of a two-franc piece, which he described as very useful for examining the posterior nares and larynx, but no cases are recorded.

In 1840, Liston, a Scotch surgeon, in his work on practical surgery, in treating of edematous tumors which obstruct the larynx, says: "The existence of this swelling may often be made out by a careful examination with the fingers and a view of the parts may sometimes be made out by means of such a glass as is used by dentists, on a long stalk, previously dipped in hot water, introduced with its reflecting surface downward and carried well into the fauces." Although much credit

has been given to Liston, it is obvious that he never contemplated an inspection of the vocal cords. It is plain that he thought the sense of touch was more to be relied on than that of 'sight, and he evidently referred to the epiglottis rather than the parts below.

In 1844, Dr. Warden, of Edinburgh, reported two cases in which he had been able to see the glottis by means of a tube and two prisms, one for throwing light into the tube and the other placed in the pharyngeal end of the tube for deflecting the light down on to the glottis. To facilitate the examination
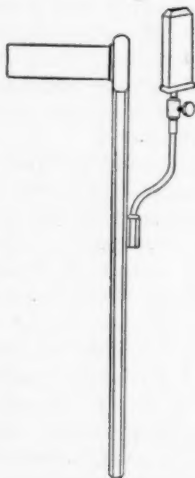
Fig. 4. Laryngoscope of Warden. A hollow canula with a long handle to which is attached a prism. This can be turned in various directions in order to divert the light from a lamp into the canula. A small prism with a metallic handle is then passed along the floor of the canula to its laryngeal end, where it serves to divert the light down to the larynx. This second prism is not shown in the figure.

(which the patient evidently found rather strenuous) he advised quieting the irritability of the throat by touching it with the finger, depressing the tongue, dilating the fauces and encouraging the patient to swallow in order to lift up the arytenoids and the epiglottis. Such a method was of no practical value.

In 1844, Mr. Avery, of London, made use of a circular re-
flector, perforated in the center, for concentrating the light on
a laryngeal mirror. This was attached to a head-band worn by
the operator. The reflector was five inches in diameter and
the apparatus worn on the head weighed a pound. The small
laryngeal mirror was placed at the end of a speculum, as in
Bozzini's case, but it was very difficult to use on account of
its irritating the throat. No cases seen with this instrument
are recorded, and it was not published until after Garcia's
paper.
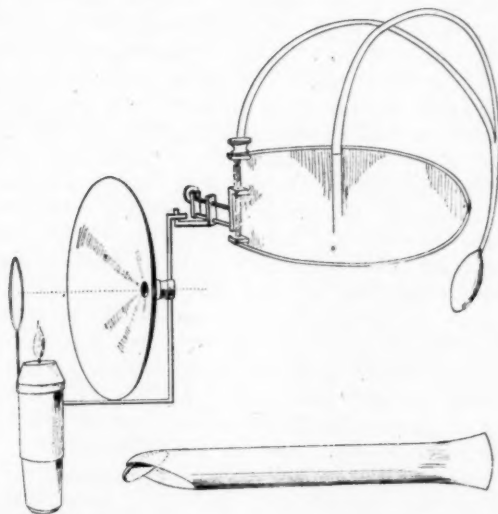
Fig. 5. Avery's Laryngoscope. Head band, mirror, lamp
speculum with mirror inside, handle of small mirror not shown in
figure.

All the experiments up to this time had produced no prac-
tical result as far as knowledge of the larynx was concerned.
The larynx as a whole had probably never even been seen and,
consequently, the physiology and pathology of the organ were
no further advanced than in the early part of the nineteenth
century. An isolated, incomplete examination, followed by no
theoretical or practical advantage, merely a medical curiosity,
which did not impress even its inventor as having any special

value,—such was the state of knowledge, or rather ignorance
of the living larynx, when, in 1854, while on a vacation in Paris,
Manuel Garcia undertook a series of laryngoscopic examina-
tions on himself for the purpose of studying the action of the
larynx in the production of the voice. He was unaware of
what had been done by his predecessors; in fact, they had not
done much that could help his studies.

"One day in September, 1854," he says, "when I was saun-
tering about the Palais Royal, busied with the wish often put
aside as unattainable but yet always urgent, namely, to see the
glottis during the act of singing, I suddenly saw both mirrors
of the laryngoscope in their respective position as clearly as if
my eyes actually beheld them. I immediately hastened to
Charriere, the instrument maker, an in answer to my inquiry
if he happened to have a little mirror on a long handle, he
replied that he had a small dental mirror which had been
exhibited in the London Exposition of 1851, but which had
been found unpractical. I bought it for six francs. After
procuring a small hand mirror, I hastened home in great im-
patience to begin my experiment. I laid the little mirror, which
I had warmed in hot water and carefully dried, on my uvula,
and with the hand mirror concentrated a beam of sunlight on
its surface. To my great joy, I saw the glottis widely open
and so distinct that a portion of the trachea was visible.

"When my initial excitement had subsided, I began to ex-
amine what was presented to my eye. The form and manner
in which the glottis opened and closed noiselessly and its move-
ments in phonation filled me with astonishment."

He was the first to conceive the idea of an autoscopic ex-
amination. He directed that the person experimented on
should turn towards the sun so that its rays falling on the
little mirror in the throat should illuminate the glottis. He
also said that if the observer experimented on himself he
should, by means of a second mirror, receive the sun's rays
and direct them on to the throat mirror. He occasionally ad-
vised the use of a perforated head mirror, when he was being
examined by another person.

In 1855, just fifty years ago, he presented before the Royal
Society of London his paper entitled, "Physiological Observa-
tions on the Human Voice," which contained the first, and a
very admirable, account of the action of the cords in inspiration
and vocalization, some very important remarks on the pro-

duction of sound in the larynx and also valuable reflections on the formation of chest and falsetto tones.

This paper created little stir at the time, and was treated with apathy, if not incredulity. It was known that he had a very tolerant throat which he, as a trained singer, had under perfect control, and his observations were thought to be merely personal and not of universal application. The fact that he was not a medical man may have lessened the interest of physicians in this epoch-making discovery.

His paper, however, passed into the hands of Türck of Vienna, who, two years later, in 1857, during the summer months, employed the mirrors and methods of Garcia on himself, and also at the Vienna General Hospital; but the uncertain light and the frequent absence of sun made him inclined to lay aside his studies, and he even declared that he was "far from having any exaggerated hopes about the employment of the laryngeal mirror in practical medicine." He was a fine musician and an able physician and was much helped in the publication of his classical work on "Diseases of the Larynx," which he published later, by Dr. Effinger, a noted watercolor artist, who illustrated the conditions seen in the laryngoscopic cases which came under Türck's care after the method had been perfected by Czermak.

This final step in the progress of laryngoscopy was made by Czermak, Professor of Physiology in Pesth, in Hungary. He had a very large pharynx, small tonsils and uvula, and was a splendid subject for laryngoscopy.

In order to study the production of certain guttural sounds, such as occur in the Arabic language, in 1857, he borrowed from Türck the little mirrors which the latter had thrown aside as useless. In order to be independent of the sun and weather, he substituted artificial light for sunlight and made use of the large concave, ophthalmoscopic mirror of Ruete for concentrating the luminous rays. Full of enthusiasm, he made journeys to Germany, France and England, journeys which were considered impossible, at that time. By his demonstrations on himself and others, he compelled an interest and knowledge of this new discovery, and at this time the "Sience of Laryngology" took its origin. In 1858, he published his first essay, entitled: "Physiological Researches with the Laryngeal Mirror of Garcia," thus showing the importance he attached to the work that had been done by Garcia.

At the time of Czermak's great activity a marked controversy arose between him and Türck in regard to various questions of priority in the use of these mirrors and methods. The rivalry, unforunate for the two individuals, had the effect of attracting attention to the subject and, in a way, was a means of making known the merits of this new mode of diagnosis and treatment.

It would be unpatriotic did we not mention a fact, probably unknown to most of you, that Massachusetts has also had a small share in the history of laryngoscopy. In January, 1858, Dr. Ephraim Cutter, of Woburn, Mass., in conjunction with Mr. G. B. Clark, of Cambridge, the noted lens and telescope maker, devised a laryngoscope similar to that of Bozzini. It consisted of two tubes, one for observation and the other for illumination, and at the oval, pharyngeal end was a prism to divert the rays of light into the larynx. I can show you a drawing of Cutter's proposal and also of what Clark wished to substitute, but I am not aware that it came to any practical use. Perhaps some of the older members of this society may know something of its fortune.

Looking over the various experimenters whom I have mentioned, we may say, in a general way:

(1) Bozzini first attracted attention to the importance of seeing into the different cavities of the body, and to some extent succeeded.

(2) Babington was, in a certain sense, the discoverer of laryngoscopy.

(3) Baumes, Liston, Warden and Avery made apparently independent efforts to examine the larynx.

(4) But to Garcia is due the merit of having first made an extended series of examinations of the healthy larynx.

(5) And to Czermak must be awarded the praise of having diffused the knowledge of the instrument and shown its value in the study of disease.

The tubes and specula had no practical result. The mirrors of Babington and Liston and the illumination of Avery were not so very unlike what we have to-day. But no knowledge of the larynx, no literary contribution, came until Garcia.

As a singer, he had learned to depress the base of his tongue, but he did not advocate in examination the drawing forward of the tongue by the left hand of the operator, and, consequently he generally failed to see the anterior part of the

cord. Fortunately, it is the posterior part where most
card. Fortunately, it is the posterior part where most
of the motion in speaking and singing takes place, hence
he was able to publish his very complete paper on the "Hu-
man Voice." In this paper, read before the Royal Society in
London in 1855, he says: "At the moment when the person
draws a deep breath, the epiglottis being raised, we are able
to see the following series of movements: the arytenoid car-
tilages become separated by a very free lateral movement, the
superior ligaments are placed against the ventricles, the in-
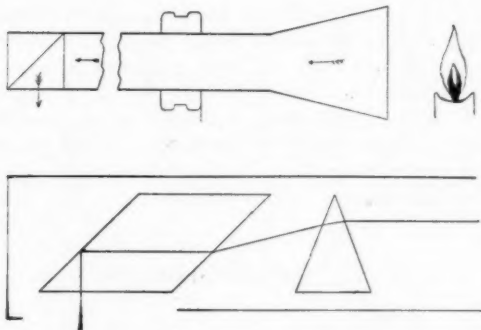
Fig. 6. Cutter's Laryngoscopic Tubes. Upper one with prism
inside is Cutter's idea for illumination of the larynx, and lower one
with two prisms is Clark's suggestion.

ferior ligaments are also drawn back, though in a less de-
gree, and the glottis, large and wide open, is exhibited so
as to show in part the rings of the trachea. As soon as we
prepare to produce a sound the arytenoid cartilages approach
each other and press together by their anterior surfaces with-
out leaving any space. Sometimes they even come into so close
contact as to cross each other by the tubercles of Santorini."
These are certainly the words of one who has seen critically,
exactly and repeatedly, not only the epiglottis, but the cords

and the whole larynx. He gave also very valuable information on the chest, head and falsetto registers, and showed that the vocal cords and not the ventricular bands exclusively form the voice, whatever its register or intensity. Although not a medical man, his work was considered so valuable that he was given an honorary degree of M.D. by the University of Königsberg, in Germany.

I have tried to bring before you a few facts in regard to the artistic and highly musical antecedents and surroundings of Manuel Garcia; his great success as one of the most famous teachers of singing in the world, his painstaking studies of his own larynx, after so many others had failed or their efforts had resulted in nothing of value; his noteworthy paper before the Royal Academy, the first *expose* of the appearance and action of the living human larynx; his honorary medical degree; the fact that his mirrors were used by Türck and Czermak, who, especially the latter, amplified and improved the art; and more especially by his demonstrations and journeys made known to the medical world the possibility of seeing and treating the larynx and thus making possible the science of laryngology and rhinology.

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XIX.

AN ADDRESS ON THE CAUSE AND TREATMENT OF HAY-FEVER.

By Prof. Dr. Wm. Dunbar,

HAMBURG.

Gentlemen: The disease of which I will speak today, in response to the invitation of your honored chairman, can be designated as a thoroughly modern condition.

Medical literature has known it for almost one hundred years through a work of Bostock's. The question as to whether it had existed for some time before then cannot be definitely answered. At least it was not very widely distributed one hundred years ago, which is proved by the statistics of Moebius and others. Even a few decades ago, according to the views in which all authors coincide, the disease must have been a comparatively rare affection. At the present day its victims number hundreds of thousands. In the United States of America alone, where, as is well known, this disease does not occur in the spring exclusively as in our country, but is especially prevalent in fall, the number of hay-fever patients is given by many physicians as at least one million. This, however, may be an exaggeration. It is a fact, however, that many American physicians of whom I have asked the question are of the opinion that there is scarcely a family in North America in which there is not one or more members who suffer from hay-fever.

Even in Germany the number of hay-fever patients is without doubt among the thousands.

If it is asked why this affection receives so little attention considering the large proportion of patients, the question can best be answered by a reference to sea-sickness. In this, too, the patient finds no sympathy among his companions. No matter how ill he is, every one knows that the patient within a short time will again be hale and hearty and every one amuses

himself more with the disease than he concerns himself with
striving to cure it. In other ways also there is a parallel with
sea-sickness. Just as in the latter, so the hay-fever patients,
when their disease is at its height, do not care whether they
live or die.

As is well known the attack of hay-fever in the spring does
not at once appear with its greatest severity. The first symp-
tom is a prickly sensation in one or both canthi, which can be
compared to the sensation experienced when touching nettle.
Then in one or both nares a similar feeling appears. Then
appear injection of the conjunctiva and lacrimation. The pa-
tient begins to sneeze and the mucous membrane to secrete.
The sneezing attacks at times may be so numerous as to follow
each other in great frequency. Then the nose becomes more
and more impermeable for air, in consequence of the swelling
of the mucous membrane. Correspondingly the chemosis of
the eye increases until the mucosa protrudes through the ori-
fice of the lids. The patient can no longer breathe through his
nose. Not only does he complain in eating and sleeping, but
in addition, this prickly feeling extends into the palate and
throat, the patient becomes hoarse, bronchitis develops and
asthma in many patients. Other patients suffer with symp-
toms similar to migraine. The patient becomes dizzy and can
scarcely remain seated on a chair. Every mental faculty is
as good as lost. He can scarcely interest himself in the news-
paper, while the ocular symptoms make reading difficult.

The patient may remain for weeks at a time in this condition.
Every medication that has been used—and there is scarcely
a drug that has not been tried by hay-fever patients—has been
found by most patients to be of no use. Suddenly, in Ger-
many usually about the middle of July, the condition becomes
better of itself and within a few days the hay-fever patient
seems entirely normal without experiencing any evil result
from his severe disease. It is this result as I have said, that
has kept the medical fraternity, as well as the rest of man-
kind, from regarding hay-fever as a very serious condition.

But when we remember that those patients are affected by
hay-fever who are subject to mental exertions, and who hold
responsible positions, it is speedily seen that hay-fever is a
vital question for many of its sufferers. If we think of the
preachers, teachers, merchants, physicians, especially surgeons
—professions, all of which possess a large number of hay-

fever patients—or of officers—hundreds of whom seem to suffer from hay-fever, it is at once clear how hay-fever becomes a factor in the patient's occupation. More than one officer has written to me that nothng was left for him except to obtain his discharge on account of hay-fever. More than one hay-fever patient has told me that many a time, when night after night he could obtain no sleep, he had determined to put an end to his life.

The picture which I have just drawn for you shows nothing especially characteristic. In those who do not suffer from asthma, it resembles a severe cold. The only characteristic feature is that it appears periodically at a definite season, and that the period of the disease in one and the same neighborhood is the same year after year, with the difference of a few days. The period of the disease, however, is different for different zones. For example, in Italy, hay-fever begins in April, in Germany, at the beginning of June, in Scotland, still later. The length of the disease in the different zones is about the same, namely four to six weeks.

It is easy to understand that the attempt to explain the cause of hay-fever should first consider the periodicity of its appearance. In many ways, this important factor has not received sufficient attention. The oldest theories are based upon the early heat of the summer; others add to this the presence of dust, but, very early, attention was directed to certain plants which bloom at the very time when hay-fever appears. Reference was repeatedly made to the bloom of the grasses, which Elliotson, as early as 1831, considered the cause of hay-fever. For many years, this theory of Elliotson was everywhere accepted, especially since Blackley supported it by extensive investigations which showed that at the time of hay-fever the air was very rich in the pollen of the grasses.

Later on, many objections were urged against the pollen theory. It was held that hay-fever was due to local changes in the nose, especially in the mucous membrane, or to a disease of certain nerve endings in the nose or maxillary sinus. Many, of whom Helmholtz was the first, considered hay-fever as an infectious disease caused by bacteria. A few years ago, the bacteriologic explanation of hay-fever was without doubt the most widely accepted. I must admit that I myself for many years accepted this theory, especially after I was able to obtain from the mucous membrane of hay-fever patients

certain bacteria in so-called pure culture, which were absent before and after. Every bacteriologist knows how difficult it is to free oneself from the bacteriologic theory when such findings are reported. I could not, however, obtain the slightest hay-fever symptoms with my bacteria. This made me doubtful.

Certain observations kept recurring to me which could not be explained by the bacteriologic theory. When a disease is found that under certain circumstances breaks out suddenly and violently, then disappears in a few hours, or even more quickly, it is difficult to believe that a bacterial influence is the origin. Such an observation I accidentally made during a trip in April through upper Italy. I suffered from a severe attack of hay-fever, lasting a half hour, during a ride from Venice to Meran, i. e., only so long as the train was passing through a region where grass was blooming. I made similar observations while taking walks through the woods. In places where the grass was blooming an attack of hay-fever suddenly developed. This disappeared within an hour after I had left the affected neighborhood.

The following circumstance has time and again led me to make hay-fever experiments. Whenever, in June, I sat down under a certain tree in the garden, I was always certain to be attacked with hay-fever within a few minutes. As soon as I went into the house and closed the doors and windows, the attack disappeared. This repeated observation made it clear to me that the air under this tree contained something which was able to cause attacks of hay-fever. I did not fail to make experiments to discover the constituents of this air. It happened while I was making a trip in the middle of June, 1902, from Hamburg to Berlin and back, in spite of a total absence of wind I saw a thick cloud of dust over a field of blooming rye. I was informed that it was the pollen of rye. During the trip, by closing and opening the windows, I could clearly see how the entrance of air would cause an attack of hay-fever or increase its severity. This observation determined me after my return to make experiments by direct employment of the pollen, to determine the question whether the pollen of plants possessed etiologic relation to hay-fever.

If I brought the flowers of the rye or other grasses, even before the pollen had developed, into the laboratory and put them into a warm place in water, and when possible in the sun

light, the spikes on the very next day were frequently found covered with pollen which was released on the slightest movement. Under certain circumstances, it was possible to obtain pollen in this way entirely free from bacteria. In our first experiments this seemed to be an imperative condition. Later on, as will be seen, it was possible to outline a method which did not demand an absolute absence of bacteria. If I put a small, scarcely visible mass of grass pollen on the ocular or nasal mucous membrane of a hay-fever patient, there appeared in a few moments the changes described above. First appeared the characteristic subjective symptoms, in the form of the peculiar prickly, burning sensation followed by injection of the vessels, secretion of tears and chemosis. In the nose the corresponding symptoms appeared, including repeated sneezing, in the same sequence as in the natural attacks of hay-fever. In normal persons the use of large quantities of pollen was without result.

This experiment gave rise to the question as to whether hay-fever patients were more sensitive to mechanical disturbances than other people. Experiments which we made with rust and dust showed that the hay-fever patients were no more sensitive than normal people.

· The method of application just described was not a very fortunate comparison with the natural process. For this reason the hay-fever patients and the unaffected individuals were requested to take their places in a large glass cabinet into which active pollen was blown, at first through glass tubes and later through ventilators. These experiments also resulted in the absence of irritation in normal people, while in hay-fever patients there was a severe attack in every case.

The idea that pollen grains were the cause of hay-fever was suggested by the fact that the surface of many pollens was covered with sharp prickles. It was thought that these prickles were too small to irritate normal people but that the very sensitive hay-fever patients were mechanically irritated. It was actually found, however, that the surfaces of many active grass pollens were entirely smooth. Although the pollen with smooth surfaces irritated hay-fever patients intensely, certain pollen grains with sharp pickles had absolutely no effect on the same patients. If a small amount of grass pollen was injected under the skin of a hay-fever patient, there appeared the above described characteristic hay-fever symptoms in the mucous

membrane of the eyes and nose, even in those cases where the injection was made in the forearm. This was followed by cough and asthmatic symptoms. The whole face swelled up and the veins became prominent, a sensation of tickling was felt in the ear, followed by tinnitus. Then there was palpitation of the heart. Some hours after the injection the entire body was covered with an urticaria. These symptoms disappeared in 24 hours. A swelling of the forearm with redness and feeling of heat spread from the point of injection. These changes disappeared only after several days. Although only a small amount of the pollen was used, these symptoms had a very grave character. In normal people, the injection of the same amount of pollen had no effect.

I should like to add here, that on the skin of the finger of the hay-fever patient, at the place where pulverized moist pollen had been lying, there were found erythematous changes, while for days at a time there was a feeling as though the finger had been pricked with a needle. The same symptoms were found when the pollen was applied to the mucous membrane of the rectum.

Taking these observations together, it is clear that every etiologic theory is without value that explains the origin of hay-fever by the sensitiveness of individual nerve endings, such as the endings of the trigeminus, or other lesions or changes of a local character, such as obstructions of the nasal passages. Especially can it be considered as excluded by my experiments, that any special sensitiveness to mechanical irritation is the cause of hay-fever. Nevertheless, the pollen of the grasses, although they are not the cause yet they are a cause of hay-fever, or contain a cause.

On the conclusion of the above experiments, I attempted to find out whether the active substance lay in a chemically characteristic constituent of the pollen, that is, whether the action was a chemico-physiologic one. As is well known, the pollen of plants contains cells surrounded by one or more membranes. The surfaces of the external membrane show, as already mentioned, projections of different kinds, such as hooks, pricks, needles, etc., or they are entirely smooth, as in the case of the grasses. The membranes consist of cellulose. They are waxlike substances as though imbedded in ethereal oil. The content of the pollen grain is called fovilla. In many varieties these are numerous granules or rods consisting of starch. The

pollen of the grasses is often filled with such rods, which under 300 to 500 magnification may be taken for bacteria. Furthermore, in the pollen there have been found water, mineral substances, cutin, suberin, nitrogenous substances of a non-albuminoid nature and albuminous substances. Pollen has also been found to contain numerous enzymes. These little microscopic bodies are chemically very complicated. By treatment of a large amount of pollen, it is possible to isolate the substances just mentioned.

Many authors in the past few years have suggested that the cause of hay-fever is to be found in certain emanations, smells or ethereal oils which are given off by the flowers of many plants.

If a large quantity of active pollen is collecetd, it will be found that they have no special smell aside from a slight malty one. It is a fact that the ethereal oils of the pollen cause an intense irritation of the human mucous membrane, but their effect is not only upon hay-fever patients, but also on normal people. Therefore they cannot be considered the cause of hay-fever. Ethereal oils are found in such small quantities in the pollen, that under normal conditions there is no possibility of an irritation.

For a time, I ascribed an etiologic factor to the starch rods. They were found, in my first experiments, especially prominent in the active pollen. Their solubility agreed wonderfully with that of the poisonous substance to be described hereafter. Later, I was able to show that many active pollen grains had no starch rods at all. Furthermore, as soon as I worked with large quantities of pollen which had remained in my possession for some time, I was able to isolate the starch by repeated centrifugalizing and washing, and to show that they had absolutely no influence on hay-fever patients. My earlier belief that the so-called starch rods contained albumin also, was thus disproved by these experiments. By salting out the pulverized pollen, it was possible to remove the active agent completely. If the fluid was allowed to stand for some time and then centrifugalized, the precipitate was found after washing to be entirely without action. If the filtrate was treated with alcohol it was possible to precipitate quantitatively the active element. This precipitate gave all the tests for albumin. When dissolved in a physiologic salt solution, it affected hay-fever patients even in the very smallest quantities. In one

case 1-40,000 mg. was sufficient to cause a perceptible reaction. Normal persons can be treated with large quantities without reaction.

Through fractional treatment with ammonium sulphate, Kammann was able to show that the poisonous constituents of the pollen toxin was precipitated only after saturation and then in the form of albumin. The pollen globulin was found to be entirely devoid of action.

I will not deny that it was very difficult for me to be satisfied with the idea that the hay-fever poison was an albuminous body. It seemed too new and astonishing that a substance which was chemically characterized as albumin and to which most men were entirely indifferent could have such an intensely poisonous effect upon certain individuals.

So far I have not been able to find an analogy to this. Furthermore, I could not give up the idea that it must be a zymotic action. In the pollen, as has been mentioned, several kinds of enzymes had been found. By accident, however, I was able to show that a solution of pollen toxin could entirely lose its poisonous character without the different enzymes suffering in any way.

Our present knowledge does not permit us a deeper insight into the chemical nature of the hay-fever poison. We must content ourselves for the present with the establishment of the fact that the pollen toxin is a toxalbumin.

On heating to 56° C., the action of the pollen toxin was entirely unchanged. At 75° it loses ¼ of its power, at 100°, ½. At 120° it is still active, but at 150°, as Prausnitz and Kammann have shown, it is completely destroyed.

These properties, especially the solubility of this toxalbumin, naturally render much easier the experimentation for determining its etiologic character.

At the beginning of my work, it was clear to me that nothing could be positively settled if it could not be shown that the substance to be regarded as the cause of hay-fever fulfilled the following postulates. It must be entirely inactive on normal people, but must be active on every hay-fever patient. According to the method of application, it must be possible to produce in the hay-fever patient, by means of the substance, one or all of the symptoms of hay-fever. Finally it must be possible to show that this action is entirely independent of the time of year or any other etiologic conditions.

So long as I worked with the pollen alone, all kinds of objection could be advanced against my experiments but these were removed by the dissolving of the toxin. Pollen, in addition, is much more difficult to free entirely from bacteria. The isolated toxin, however, can be made free from bacteria whenever necessary by heating or filtration.

The proof that the attacks of hay-fever in patient is produced by the pollen toxin throughout the entire year seemed necessary to me in as much as hay-fever is limited to certain periods of the year. Frequently, I have been met with the belief that in men, in the course of years, there has been established a cycle which can be compared with that observed in the higher plants which every spring come to life after their winter sleep. It was thought that in hay-fever patients the attacks occurred every spring out of purely internal causes without external causes at all. Now, since the pollen grains, as has been shown by experiments still to be described, enter into every room where the windows and door are not tightly closed, and are deposited everywhere, to be easily set in motion by every movement, it is very difficult for hay-fever patients to keep themselves from attacks of hay-fever in the spring. It was my duty, therefore, to show that a vernal evolution was entirely unnecessary and that the disease could be produced at any time of the year. Furthermore, as is well known, hay-fever does not appear in North America in the spring, but in the fall, so that a vernality in man was completely excluded there.

It has been suggested that pollen grains could not be the cause of hay-fever on account of their scant numbers in the atmosphere. By means of the toxin solution described, I was able, however, to show that one or a few grains of pollen contained enough toxin to produce intense symptoms in very sensitive patients. On the other hand, during the hay-fever season, that is during the period of the blooming of the grasses, a tremendous quantity of active pollen is found in the air. The number of pollen grains in the air can be determined after the method of Blackley. The latter showed that even in the middle of the City of London, an extraordinary number of pollen grains were to be found in the air in the spring. Liefmann found in Hamburg that the most pollen was to be found in the air when the hay-fever patients suffered most. He calculated that as many as 4,000,000 pollen grains within 24 hours fell upon a surface of 1 square meter. With such an amount of

pollen, many hay-fever patients could not exist if nature did not come to their help and wash away most of the pollen by means of the increased secretions of the mucous membranes, before the poisons were absorbed.

The observation that hay-fever patients feel better on rainy days and worse on warm, dry and windy days can be explained by Liefmann's suggestion, which has been confirmed by Prausnitz. The rain washes the pollen out of the air but at the same time causes a profuse formation of pollen in the flower, which is distributed through the air as soon as the rain has dried.

Before the significance of the pollen had been experimentally shown, hay-fever was etiologically one of the most complicated diseases. On the one hand, on account of the great role which the individual disposition played in these cases, and on the other hand, on account of the great irregularity which the attacks showed from day to day, which could not be understood, no explanations could be given of the meteriologic influences upon the origin and extension of the cause. Therefore, numerous hypotheses are found which depend upon the question of the etiology of hay-fever. At the present time, when we know the cause and are able to investigate it, many symptoms can be explained that formerly were entirely without explanation, and which gave the patient the right to change his views as to the cause of hay-fever repeatedly in one day.

For instance, if a hay-fever patient during the period of the disease goes out into the open air, he can for a certain space of time be entirely free from attacks. If however, there should be a cloud of dust which introduces the small iritating particles into the eye and on to the nasal mucous membrane, the latter begins to secrete. Now since pollen grains are there, the poison is dissolved out of them and made active by the tears or nasal discharges. It is no wonder that the patient, so long as he was ignorant of the importance and distribution of the pollen, said that the dust caused his attack. But then came the thought, why did not the dust cause similar attacks in winter? It was often said that bodily exertion coupled with intense heat produced these attacks. Now it is to be explained on the ground that the bodily exertion favors secretion and causes the solution of the poison which had formerly been deposited.

The attacks which begin in most patients in the morning on

dressing and usually shortly after washing, and of which many patients were disposed to consider contact with cold water as the cause, I explain in this way, that the movement or sudden excitation of the previously dry mucous membrane brings about a secretion.   Since I paid attention to this point, I find it confirmed daily that contact with cold water causes a secretion of my nasal mucous membrane.

Frequently the secretion of the mucous membrane commences only when the patient, after being overheated, comes suddenly into a cool room.   This may be seen in bicyclists. The patient concludes that the sudden cooling off had caused hay-fever, and he thinks that hay-fever is a special form of cold.

That under certain circumstances, penetrating odors, for example the smell of flowers, may cause the mucous membranes to secrete, I consider very probable.

Cats and horses play a great role in hay-fever literature. Many patients think that the smell of animals make them sick. I will return to this point later.   I desire to state that one patient, who was confident that he became sick from the smell of a horse, reacted violently to pollen toxin.

Medical literature is rich in the discussion of the individual disposition of certain people for certain diseases.   In infectious diseases we must, without doubt, consider the difference in the power of an individual to withstand the cause of disease. Experimental investigations of this question, however, in infectious diseases have drawn sharp limits. Hay-fever offers special advantages for such experiments, and it can be expected that in many ways explanations can be given of the circumstances causing the differences in individual predisposition.

I have stated that most people are in no way affected by the pollen toxin, while it is a very strong poison for hay-fever patients. The pollen toxin has been used not only in Germany and neighboring lands, especially England and Scotland, but also all over North America. Hay-fever patients everywhere react in a similar way to the smallest doses of the toxin, while normal people, many of whom were tested were unaffected. For this reason I have considered that I was correct in stating that the hay-fever appearing in Spring was a disease with a single cause.

In regard to the Autumn catarrh which is very prevalent

in North America, it was a priori to be expected that it was etiologically somewhat different. In North America, as is well known, the wheat industry is a very large one. The wheat blooms there at the same time as in Germany, without causing a disease in the hay-fever patient. Their disease does not appear before August. At this time, throughout the entire United States one could say, not only in every field, in every meadow and in every forest, but even in the largest cities, there blooms the ambrosiæ, which are commonly known as ragweed; furthermore, there is a plant similar to this, one of the solidago family, the golden-rod. From the pollen of these two plants, I have isolated an albumin which is inactive towards our hay-fever patients, but active towards the American suffering from Fall catarrh. On the other hand, these do not react to the toxins of the grasses. During my trip to the United States last Fall, I used the rag-weed and golden-rod toxin in different places upon physicians who suffered from Fall catarrh and have always received confirmatory results. On the other hand, normal persons are absolutely unaffected by the toxins of these plants. The American Fall catarrh is therefore a disease with a single etiology.

There are persons who react to both toxins, the graminæ as well as the poison of the Fall catarrh. Such persons are also found in Germany. In North America such patients suffer from the beginning of May until October.

The observations which I have just described shows that pollen toxin is of great value for diagnostic purposes. I have repeatedly had patients brought to me as hay-fever patients who did not react to the toxin. Questioning in such cases revealed that the symptoms appeared not only in Spring, but at all times of the year. It is greatly to be desired that, in taking a history, more value should be placed upon the periodicity of the hay-fever. Furthermore, it must be remembered that pollen is deposited in our dwellings and working places and that even in the winter, by stirring up the dust, it can be made effective. In North America, golden-rod is frequently used in decorating the table. Furthermore, tne pollen of asters and chrysanthmums, as I lately shown, contains a poison which is active towards those persons who suffer from Fall catarrh. Many attacks of hay-fever which break out at flower-bedecked banquet tables can thereby be explained.

I could report to you many single observations which would

be of interest to one or another of you, but my time does not permit me to go more into detail. I must rather turn to the experiments that were made to produce a specific antitoxin. One of two rabbits, into whose blood-vessels I had injected pollen grains, gave no trace of an antitoxin even after having been treated for a long time; on the other hand, in the serum of the second rabbit, there was found within a very short time so pronounced an antitoxin action that the possibilities of obtaining a specific therapeutic serum could be considered as established.

Further experiments confirm the above observation, whereby it is shown that even in animals, and even in members of the same race, there are found individuals who are absolutely indifferent to pollen toxin, and on the other hand, there are individuals for whom the same substance is an intense poison. The difference is greater however in the reaction of different kinds of animals.

I may not go further in regard to this point to-day, and will state only that among seven goats, I found only one which gave antitoxin, in spite of a thorough and long continued treatment with toxin. Of the horses tested, the majority were likewise entirely indifferent to the pollen. However, in the course of time, animals were found that reacted very strongly to comparatively small doses, which were much less than those which were absolutely without effect upon goats.

By continual employment of increasing amounts of toxin, it was possible to increase gradually the resistance of certain horses, and in the course of some months, the presence of a pollen antitoxin could be shown in their blood. The antitoxic action gradually advanced to a certain point, which is about the same in all horses so far tested.

If a solution of active toxin obtained from pollen is mixed with the blood serum of any normal animal, its action is not affected.

In such animals as are shown unresponsive to pollen toxin, it is also unchanged in spite of long continued injections of large quantities of toxin. Under certain circumstances, injections can be made for some months into those animals which react without the blood serum of the animal exercising the slightest neutralizing effect upon the pollen toxin. The blood serum of certain other animals, however, show, within a few weeks, a distinct, antitoxic action. If a solution of the

pollen toxin, which causes distinct irritation of the mucous membrane of a hay-fever patient, is mixed with such a serum the irritation is absent. It is possible, also, to conteract with such a serum the irritation caused by the pollen toxin. Experiments in this direction cannot be carried out upon animals, since their mucous membrane is not sufficiently sensitive to pollen toxin. The mucous membranes of hay-fever patients alone are suitable to that. Such experiments are not very annoying to them when the fundemental principles have once been established. Permanent injuries are not to be expected, since the artificial reaction lasts a much shorter time than those that are caused during the hay-fever period, and of these it is well known that they leave no bad effects behind, even after they have returned for decades, and that the patient is usually at once hale and hearty, as soon as the period when the grasses bloom has passed.

It occurred to me to try to neutralize the pollen toxin by menas of cocain, adrenalin and anesthesin and similar drugs, which have been used for years by hay-fever patients. Not the slightest neutralizing action could be obtained thereby. Furthermore, the amelioration which was obtained by such means in experimental hay-fever was very doubtful. The transient amelioration of the symptoms was quickly replaced by their increase; the headache was especially more intense.

The experiments to destroy or to render inactive the pollen toxin by means of different enzymes did not lead to results capable of therapeutic use. We obtained results in the formation of pollen antitoxin whenever the pollen was used subcutaneously or intravenously. Although large amounts of pollen were fed to animals, we never obtained the slightest amount of antitoxin from the blood serum of the animal tested.

The blood serum of the horse treated with pollen toxin is naturally not capable of therapeutic use as soon as the first signs of antitoxin formation is noted, but it comes into question only when it has reached a certain value. For prophylactic purposes, a serum of only the scantiest antitoxic contents is usually sufficient. To control irritation already present a larger amount of antitoxin is necessary. In a systematic prophylactic treatment, it is apparently possible to calculate according to the least patient and therefore the antitoxin is generally used in the practice in too great amount. In the

course of time, we have been able to produce a comparatively active antitoxin. Earlier, it was not possible to bring the standard of the serum, which I will explain in a few moments, over 20. Now however, it ranges between 30 and 40 in our best horses.

The estimation of the value of the blood serum was made in this way: A pollen toxin solution of permanent strength is mixed with various masses of serum to estimate the neutralizing strength of the latter. As the starting point of our estimation, we use an amount of poison which is just able to cause a severe, objectively visible irritation of the conjunctiva. That amount of antitoxin which exactly neutralizes this amount of poison we have called antitoxin unity. A serum of which one c. cm. exactly neutralizes one c. cm. of our toxic solution we have called the unit (einwertig). This toxic solution is so chosen that one drop of it, 1/30 of a c. cm., causes distinct irritation of the conjunctiva of a certain hay-fever patient. If 1 c. cm. of an antitoxic blood serum neutralizes 1 c. cm. of this toxic solution, it is univalent; if 1/2 c. cm. of serum neutralizes 1 c. cm. of toxic solution, the serum is twofold (zweiwertig), if 1/20 of a c. cm. of this serum neutralizes 1 c. cm. of the toxic solution the serum is twenty-fold (20 wertig), etc.

Such tests have been made hundreds of times, and it has been shown that the results so obtained, even in those patients whose sensitiveness is very different, still lead to coinciding results, when the concentration of the poisonous action has been carefully chosen.

Theoretically the possibility of such an agreement in the estimation of the value seems very doubtful for the following reasons:

From the description given by Dr. Prausnitz lately, in the *Berlin. klin. Wochenschrift,* of the experiments made in regard to this subject, it may be deduced that neutral mixtures of toxin and antitoxin cannot be obtained if the antitoxic amount is increased in the same proportion as the toxin, but that a doubling of the amount of toxin under certain circumstances can demand a multiplication of the amount of antitoxin.

Now, it can be shown that different hay-fever patients show a very different susceptibility to the pollen toxin, that for example patient A. reacts to an amount of toxin 1/20 the amount required for patient B. If patient A. tests an antitoxin by the

use of a poisonous dose 1/20 the *dosis minima efficax* for B., it is possible to find a serum more than a 100-fold though it was the unit dose for B. If the test however, was made by using the *dosis minima efficax* for B., the results in the cases of A. and .B. coincide completely. Under certain circumstances, A. will still show a certain reaction, since twitching will appear in the affected eye, although there will be no injection of the conjunctiva. This will show that in the mixture there was less than 1/40,000 of a mgr. of free toxin (ie. less than that dose whch causes in A. an injection of the conjunctival vessels objectively visible).

By means of experiments carried out for many years by Dr. Prausnitz and myself, we have reached the conclusion that the certainty of the estimation of the value, whether obtained by immunizing or in other ways, does not gradually suffer. On the contrary, we were able to show that repeated estimate of the value of the same serum, after the lapse of years, gave the same results.

That we were able to test the antitoxic value before each removal of blood from a horse, exerts a control important for practice, as is seen from the favorable results obtained in our practice, to which I well refer again later.

I would like to note, at this place, an interesting observation which we made during our testing. The patients, as far as our tests have gone, seem invariably to react to the subcutaneous injection of normal horse blood by local swelling, redness and heat at the point of injection. When normal horse serum is dropped upon the conjunctiva of hay-fever patients, no reaction follows. The same was the case on the application of dried serum. Not one of the hundreds of hay-fever patients, whom we have tested, reacted to the blood serum of the horses that were treated with pollen toxin. It is true that during the hay-fever period, irritation has been repeatedly ascribed to the antitoxin. A closer observation showed in every case except one, which I will discuss presently, that they were patients where the necessary control was lacking and who now ascribe to the antitoxin the same symptoms which they for years have suffered, and which they had heretofore called hay-fever.

The fact must be noted, however, that patients whose conjunctivae have been treated with pollen toxin occasionally react to applications of antitoxin by an increase in the irritative

symptoms. This was frequently to be explained by the fact that the tears or mucus secreted dissolved and made active the toxin that was already present, but undissolved, before the antitoxin could attack it. It cannot yet be settled whether or not this explanation is sufficient in all cases, nevertheless this transient irritation which may cause several severe attacks of sneezing is followed within a very short time, at the most 10 or 15 minutes, by a complete disappearance of the irritation, which in turn is followed by a period of immunity against the toxin lasting an hour or longer as happens under normal conditions.

Only in one case were we convinced that even outside of the period of hay-fever, i. e. when pollen toxin was not present on the conjunctiva, in consequence of the application of the serum of a horse which had been treated with pollen toxin, there appeared an intense injection of the conjunctiva. The same symptoms, however, appeared when normal horse serum was applied, nor was it absent when heated normal serum was used. This patient, therefore, showed a very pronounced idiosyncrasy against normal horse serum. Here, I might mention that the literature is rich in cases, according to which, certain persons could not endure the presence of cats and horses. Even if a cat was concealed in some corner of the room, the patient would commence to sneeze on entering the room. As everyone knows, such stories are usually exaggerated. But whenever a patient takes a cat on his lap, he must remember that this cat had probably been rolling around in hay, and that in this way, pollen grains may have become deposited in its fur and can be dusted out by stroking the animal, and are breathed in by the patient.

The same is true of horses, that usually every day, for hours at a time, pull down hay from mangers which are high above them, in which way the pollen contained in them has had abundant opportunity to become dusted out and caught up in the hair of the animal. Whoever, then, strokes the horse, rides him or travels after him is in danger of now and then breathing in grains of pollen, which are freed by the movements of the animal. I will not, however, deny that there are people who have attacks of asthma when they smell horses. This idiosyncrasy however, does not necessarily have anything in common with the idiosyncrasy shown by certain patients towards horse serum.

A short time ago, such a patient declared to us that he could not stand the smell of a horse, that he was not a hay-fever patient, and that he worked with horses during the year. Testing this patient showed that he was very sensitive to pollen toxin, and that the symptoms caused thereby were promptly counteracted by antitoxin. He was simply a hay-fever patient who did not call himself such, but had another explanation for his disease. This was of unusual interest to me, because I had theoretically assumed such cases as the one described.

Furthermore, in preparing the pollen antitoxin we made the following not unimportant observation: In the blood serum of certain horses, the antitoxin appeared in the usual way in such an amount that the blood serum neutralized large quantities of pollen toxin. In spite of the high concentration of the antitoxin, the serum itself showed an irritative action found only in hay-fever patients but not in normal people. Some substance acting specifically on hay fever patients must therefore be produced by the pollen treatment, which can not be the pollen toxin. Otherwise, it would have been neutralized by the excess of the antitoxin.

To return to the production of the antitoxin and its therapy, which certainly interest many of you very much, I can state to you that the well know firm of Schimmel & Co., in Miltitz, near Leipzig, are prepared to furnish the antitoxin and have relieved me of a lot of work which in the beginning was necessary. They call the substance Pollantin.

Schimmel & Co., have in their manufactory in Miltitz a stable for the purpose of making the Pollantin which is under the constant control of the veterinary department of the University of Leipzig. The injections and the removal of blood are done exclusively under veterinary regulations. The greatest care is taken that the blood shall be from entirely healthy animals.. The serum is examined in regard to its concentration and its bacterial contents. The removal of blood takes place only with my approval of each case. In this way the production of antitoxin of constant value is assured.

Subcutaneous use of the antitoxin seems excluded on account of the above mentioned idiosyncracies of many, perhaps of all hay-fever patients towards normal horse serum. Since it has been shown that the antitoxin is completely bound to

the globulin, experiments are being made leading to the production of a serum suitable to subcutaneous injection.

I do not consider it absolutely necessary to have such a serum. I consider that it is rather a great advantage of the antitoxin that success is obtained without recourse to injection.

Hay-fever is distinguished from those diseases, in which for a long time specific antitoxins have been used, by this fact, among others, that the infection takes place not only once, causing a development in the body of the infectious matter, but that for many weeks the poison continually attacks the patient. A subcutaneous treatment would be very desirable in such cases if it were possible thereby to make the patient non-sensitive to the toxin for a long time, say for one or two weeks. This seems, however, in the light of our present knowledge, to be impossible. I have been compelled to give up active immunizing of hay-fever patients as not suitable for practice.

Under such circumstances, a method of application must be found which is possible for every patient at all times. It was therefore a pleasant surprise to me to find that the simple application of a drop of serum to the conjunctival sac or the nares was entirely sufficient to make these ports of entry for the poison completely insensible and even to counteract symptoms that had already appeared. Personally, in view of this fact, I have no desire for any other method, for a simpler method of application could not be found. There are, however, patients and physicians who, for some reason or other unknown to me, desire a subcutaneous use of the Pollantin. I will admit that in cases of severe asthma or bronchitis, as are observed in the American form of the disease, or in cases where the nares are entirely occluded for air, the question arises whether or not a subcutaneous use of the remedy would be able to relieve these bad conditions. It has been shown, however, that in most cases where the nares are entirely occluded, results can be obtained by repeated application of the Pollantin to the conjunctiva. The action takes place on the nasal mucous membrane via the tear ducts. If, in addition, tampons of cotton impregnated with antitoxin are introduced into the nares most affected, in the course of about half an hour this becomes completely freed, and the cure can be carried out on the other side. Furthermore, it seems very advantagous on the worst days to alternately bring the mucous membrane of the nares

to rest and treat it prophylactically. This is done by alternately closing the nares with a pledget of cotton after the use of the antitoxin.

After it had been shown that Pollantin was suitable only for external treatment, there appeared practically the objection, that it was difficult to prevent the tears or mucus coming in contact with the remedy and infecting this with bacteria. We tried to prevent the decomposition of the serum by using a disinfectant. It was found, however, that with the exception of carbolic acid no other remedy could be considered, and that this in itself caused irritation in the concentration which was not always sufficient to protect the antitoxin, during use, for longer than a few days. The futility of all experiments led me to dry and pulverize the serum. In this form it cannot be decomposed by bacteria. It can be brought by means of a small spatula or brush into the mucous membrane, for months, out of one and the same package without the slightest signs of decomposition of the remedy.

It was found, however, that this powder when used alone exerted a mechanical irritation upon the mucous membrane. It had to be diluted with a soluble, sterilizible, neutral substance. After many tests, I chose sugar of milk as the most suitable, because it excited the secretion of the mucous membrane and caused the antitoxin to pass into the solution more quickly.

I have already stated that it seemed impossible to bring the antitoxic contents of the horses' serum above a certain height, even after years of treatment. Still the strength already obtained is considerable and a few drops of the serum contains enough antitoxin to neutralize the entire amount of poison which affects us during the hay-fever time in the course of one day. It has actually been shown, also, that many patients, who have used the antitoxin in strict compliance with the directions, have used during the entire hay-fever season at the most not more than three grams of the pulverized remedy, and have kept themselves entirely free from attacks. Personally, I use only the powder, and recommend this because numerous patients cannot stand the carbolic contents necessary for the fluid preparation. Some physicians as well as many patients have accustomed themselves to the fluid preparation and desire it. For this reason the manufacturers prepare it.

Naturally, it was very difficult to make hay-fever patients

believe in a single treatment of their disease, when almost every one was an intelligent person, and each one had his own theory in regard to his disease.

Almost every hay-fever patient believes that he should have as much fresh air as possible. I can understand this very well and must admit that as long as I was ignorant of the etiology of hay-fever, I kept the window open at night during the hay-fever time, because the disease, although not a direct dyspnea, gave the feeling that necessary fresh air was wanting, but as soon as the patient is so situated that he either does not come in contact with the pollen toxin or neutralizes this immediately, this symptom disappears. It is therefore an expression of the intoxication. The most difficult task seems to me to compel the hay-fever patient, during the period of the disease, to keep his doors and windows closed at night. There are indeed patients who, on account of correct use of antitoxin remain free from attacks throughout the night, even when their windows are left open; these patients, however, are in the minority, and there are at least many patients in whom the transient immunity does not last so long. During the night, i. e., during sleep, the patient is less sensitive to the poison. He is most sensitive, as I could prove in periods other than the hay-fever season, when he awakes in the morning. The entire action of the poison assimilated during the night comes on awakening, i. e., takes place at the most sensitive time of the day, and it is not always possible to counteract immediately and completely the severe attack that follows, by means of the Pollantin.

It has therefore been recommended, in the directions given with the Pollantin, to use it in the morning upon awakening and while in bed. The attacks come as soon as the patient begins to move. Upon washing with cold water, as already noted, the secretory power of the mucous membrane is excited; the poison is thereby dissolved and, as most patients have observed upon themselves, the attacks are usually most severe. If the antitoxin is applied while the patient is still in bed, the attacks are sometimes completely avoided. This does not always happen. Sometimes it will seem to the patient that the attack is caused by the antitoxin. It is a fact that secretion and, simultaneously, the solution of the poison already in the nares is caused by the Pollantin, and is most probable that the action of the poison upon the mucous membrane is

the more rapid. If the patient under such circumstances, does not lose courage, but uses the antitoxin, if necessary, two or three times within a half hour, it will be possible almost without exception to check the attack and bring about a condition of insensibility towards the poison for several hours at least.

Every hay-fever patient should study himself in this respect. I believe that it is not well for all patients to use the remedy. upon arising, but that it is better if they make the application at the time when they are going out into the open air. For many patients it has been found best for them to use the remedy in the evening just before going to bed; others find it better however, to use the Pollantin at least one to two hours before going to sleep, in order that it may be completely dissolved and absorbed before the eyes are closed.

The greatest mistake that can be made is to use the remedy in too large doses. I have had a number of patients who say that they have used in one or two days as much Pollantin as would last the entire season by careful use. These were the patients who were dissatisfied with the action, and I consider that the reason for this is very clear. Our conjunctiva is not adapted to be carelessly filled with powders as happens in many cases, e. g., that of Wolff (1) who placed 1/15 of a gr. of Pollantin in the eyes of his patients and then noticed an irritation.

I would consider this as self-understood. I am accustomed to tell my patients to dip the brush in the Pollantin powder and to touch the external superior border of the lower lid with the brush in such a way that a white point is visible on the lid. If the eye is opened and shut once or twice it can be seen that the powder is moistened by this movement and carried into the conjunctival sac. Under such circumstances scarcely the slightest mechanical irritation will be caused by the use of the Pollantin, and the amount of Pollantin thus used is sufficient to neutralize the comparatively small amount of poison which has come into the eye.

To make the use of Pollantin powder in the nose easier, small aluminum spatules are fastened in the corks of the glasses. An amount of powder more than the size of a lentil should never be used. I have seen patients who applied 20

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(1). A. Wolff-Beiträge zur klin. Med. (*Festschrift für Senator*) 1904. Wolff's article is used as an advertisement for Graminon, a product which irritates hay-fever patients very much and does not contain antitoxin.

to 30 times the amount, and placed the spatule completely filled with Pollantin in the nose. This must naturally irritate the mucous membrane which is already sensitive on account of the toxin.

Dr. Goldstein, of St. Louis, has made an instrument by means of which the patient can blow the Pollantin into his own nose and distribute it without being compelled to snuff it up. I have used Goldstein's apparatus with good results, and have recommended to Schimmel & Co. to have it for sale at drug stores, in connection with the Pollantin.

It is not necessary for me to go further into the method of use. The directions accompanying the medicine must be changed yearly on account of the progress in our knowledge. I have observed an unpleasant feature in the United States of America. Certain physicians handle the Pollantin themselves and give it to the patient at very high prices, after they have very carefully removed the directions and everything which the patient could use in treating themselves. If these physicians had taken the trouble to read the directions carefully, and to acquaint the patients with the chief points therein, we could have passed over this circumstance as a necessary evil. I consider it very reprehensible that the patients were left without any instructions at all, and therefore could not use the remedy rationally.

We have, as has been said, to do with a remedy which differs from most other remedies in that it is not used, bought and taken at specified periods, but which demands intelligence and a certain amount of skill on the part of the patient. In consideration of these facts I had counted a priori on no very favorable reception. I was astonished by the very satisfactory reports of the patients who wrote to me.

Dr. Luebbert has tabulated our corespondence and finds that out of 505 patients, 299 (59.20 per cent) had used Pollantin with absolutely favorable results, i. e., had remained without an attack during the entire period. 143 (38.30 per cent) used Pollantin with partial results. 63 (12.50 per cent) without results.

It is a matter of experience that we hear sooner from the dissatisfied than from the satisfied. That this old experience has happened in the case of Pollantin is shown by the fact that I very frequently hear wonderful results, which are called to my attention, accidently, in social intercourse or otherwise.

Although our statistics embrace only about 500 cases the remedy has been used by thousands of people, and I do not doubt that the statistics of Luebbert will be more favorable when the communications as to the results are more complete. In order to contribute to this, Schimmel & Co., have determined to include with the Pollantin this year a blank for scientific purposes. I insist that in the work which will be based upon it, no names under any circumstances, will be mentioned. In those cases where reference to occupation, etc., seems desirable, we are always accustomed to obtain the consent of the patient.

It is furthermore very difficult to obtain true complete results as to the practical value of the remedy. There are patients who continually write and complain that they do not succeed with the remedy. If one finally loses patience and advises them to cease using the remedy, they will write that they were misunderstood, and are unable to live without the remedy, only they cannot keep themselves from occasionally sneezing. They thought they were obliged to let me know that. Still, I think that Luebbert has settled so well the difficult task of critically working over our correspondence, that the statistics published by him are of durable value. He classed as complete results, only those cases where the remedy was used during the entire hay-fever period, and the patients during the entire time remained free from the disease.

chiefly the pollen of grasses. These, especially those of rye

In speaking of the etiology of hay-fever, I have mentioned and wheat, are practically the chief cause of hay-fever in Germany, although specific pollen toxin has been found in certain other plants, for example, lily-of-the-valley. The same is true for all European states. In India the rice bloom has the same effect as the rye bloom here. It has been shown that as far as Australia, hay-fever in toto is an etiologic unity agreeing with European hay-fever. An exception is found only in the United States and Canada. Here the European hay-fever is also found, but it is designated in addition to hay-fever as Rose-cold, June-cold, Peach-cold, etc. In all these cases the affection seems to be the European hay-fever. In these countries there appears later, in the first days of August, an affection that agrees clinically almost completely with hay-fever. In many cases the patients are the same as those who suffered in the Spring. The vast majority are other persons. It is a priori certain that the pollen grains of the graminæ cannot be the

cause, but, if it is pollen grains at all, it must be of those plants which bloom in August until the beginning of frost. Such plants are found there in such wide distribution that they can almost be called the national flower, as has happened here and there. As was mentioned before, these are the golden-rod and the rag-weed whose flowers cover every meadow, field and forest of the northern states and far into the western with a golden yellow color in the Fall.

To better test whether the American Summer catarrh was caused by these plants, I tried to obtain specimens of their flowers in Germany. It happened that the Botanical Garden in Hamburg had planted these two plants. The solidago bloomed but the ambrosia did not. Through the kindness of Prof. Voigt, however, I obtained a flower of the latter which had been plucked two years before and preserved in a herbarium. From these flowers I could obtain enough pollen to prove that in those persons suffering with American Fall catarrh, the characteristic hay-fever symptoms were produced by the pollen grains of the rag-weed. Some European hay-fever patients were unaffected by the toxin of the rag-weed and the golden-rod, while others, as for example myself, re-acted to them. I think I may conclude from this that the persons suffering in the Fall in America are affected by hay-fever.

Many years ago, during a residence of several years in America, I never experienced the symptoms. I am therefore confronted by the question whether in the meantime a tendency to this disease has developed in me. When last fall I made a trip, about the middle of August, to America and the steamer was still 500 English miles from the land, the first symptoms of Fall catarrh appeared increasing in the proportion as we neared land. On my arrival I learned that the disease had just broken out everywhere.

In the meantime, I have had abundant opportunity to show that the pollen grains of both the rag-weed and the golden-rod contain an albuminous substance which affects persons suffering with American Fall catarrh, but does not affect other persons. Against my statement that Fall catarrh was caused by golden-rod pollen, numerous American colleagues who suffer from hay-fever presented most varied opposing arguments. They claim that they could walk through places where the golden-rod was blooming, pluck the flowers and shake them in front of their eyes and nose without being affected. In all

such cases I could at once remove this opposition when I applied toxin which I had brought with me made out of goldenrod pollen and with it caused hay-fever symptoms. These colleagues may be right in claiming that the golden-rod has practically less significance than the rag-weed, for it does not shed its pollen so easily. At least this seemed to be the case for certain kinds.

Furthermore the toxin of the golden-rod seems to me to be almost completely if not entirely identical with that of the ragweed. I conclude from this that the toxin and the antitoxin will influence each other.

In the year 1904 after I passed through the entire hay-fever season in Hamburg, it was my fortune to come to Scotland just when the hay-fever had broken out there. By means of the Pollantin I was able to protect myself from attacks, even during the railroad journey. Most interesting was a third campaign in the United States. Thither I had taken an antitoxin obtained by means of the solidago pollen. I put off its use until the symptoms of Fall catarrh had developed intensely, producing a very severe bronchitis, because I wished to convince myself completely as to whether my susceptibility to the poison, which I had found by experiments was confirmed by practice. After this question had been settled in the affirmative, I began to use the antitoxin with such good results that I could ride thousands of miles without suffering in the least.

On this ground I am convinced that the fundemental laws have been laid down for the explanation and treatment of the American Fall catarrh.

In America, I saw truly pitiful results of Fall catarrh; men who, so to say, could neither live nor die. I was very much interested by the difference in the results obtained by the American physicians. Some of them devoted themselves to the study of Pollatin with a true enthusiasm, and they had had wonderful results as I could convince myself. Others had less favorable results. In all of the latter cases, however, it was not difficult to show that the method of using had not been correct. The chief cause of the failure was a too abundant use of the remedy.

On many occasions I was compelled to tell about my hay-fever studies, and I met with extensive discussions and thousands of doubts. These vanished the moment that I could use the necessary toxin and antitoxin, and the physicians suffering

with hay-fever who were always present in large numbers
were ready for a demonstration upon themselves. Now when
half a dozen physicians, and especially those who were my
most violent opponents, had been treated with a drop of toxin,
and the hay-fever symptoms had very promptly appeared, and
when a similar number of normal physicians had remained
unaffected, and when the severe irritation had disappeared in
a few moments under the influence of the antitoxin, the effect
was complete and every one who suggested dogs, cats, arti-
ficial flowers and autosuggestion were laughed to scorn.

How does it come then, that people who have always lived
in Europe where golden-rod and rag-weed are never found
and who therefore have never been affected by their specific
toxin are sensitive to this poison which as far as our knowledge
reaches is present only in these plants and perhaps no where
else in the world?

So long as the proof of such conditions was not found, it
was natural to think that the disease was to be considered the
expression of an acquired or inherited supersensitiveness for
which contact with the poison was responsible. Such an ex-
planation must be given up, the more so when it is remembered
that hay-fever frequently, if not usually, appears as a sequel
of influenza. The lasting lesions which are caused by in-
fluenza have certainly no etiologic relation to the albuminous
constituents of the pollen of grasses.

I have already made the attempt to sketch the different pos-
sibilities which present themselves on the ground of Ehrlich's
experiments and theories.

I will not enter into this point to-day, but will only mention
certain questions with which I have busied myself during the
course of the last year.

Wherein lies the reason that of two apparently normal men,
one reacts most violently to the constituents of certain pollen
grains while the other is entirely unaffected by the same? It
might be thought that in the bodily fluids of the hay-fever
patient, the pollen substance is so changed that it is developed
into a poison, either by a fermentative or degenerative process.
This explanation is disproved by the fact that pollen toxin
after treatment with the serum of hay-fever patients is in-
active towards normal persons.

Furthermore, one could think that the normal person pos-
sesses a natural antidote which is lacking in the hay-fever

patient; such an explanation has already been made as I have found in the literature. It is disproved however, by the fact that the pollen toxin, after treatment or even after being dissolved in the blood serum of normal men or animals has its activity entirely unchanged.

The cells of the mucous membrane of the patient react to contact with pollen toxin with increased secretion. Simultaneously all the vessels of the affected mucous membrane dilate. This could be due, either to an irritability of the cells or of the nerve endings. The last question does not seem easily capable of solution by experimental means. The question as to the specific irritability of the cells I have been able to approach in several ways with results that were astonishing in many ways.

Although, with the assistance of Dr. Kammann, I have made numerous valuable experiments for two years, and although we have frequently observed the workings of the pollen toxin on the cells of the patients in a manner that can be described as specific, I must admit that the experiments are not absolutely satisfactory. Until this is the case, we do not desire to pubilsh our findings.

We hope, however, that we shall be able, in a very short time, to demonstrate the individual predisposition of hay-fever patients to pollen toxin and the relation of hay-fever to influenza by means of simple experiments that can be carried out in the test tube.

XX.

THE SERUM TREATMENT OF HAY-FEVER.

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Until Dunbar[1] introduced his serum treatment of hay-fever, the remedies which had been used, had attained so considerable a number that it was obvious that the specific had not been found. Thus Sticker[2] mentions the following:

Quinin, iron, arsenic, salicylic acid, sulphur dioxide and carbonic acid, salt solution, glycerine, boric acid solution, sodium phosphate (1-500), carbolic acid (1-100), bichlorid of mercury (1-5000), hydriodic acid, peroxide of hydrogen, sulphuric acid, ammonium carbonate, chloroform, eucalyptol, chromic acid (1-100), lactic acid (20-100, 50-100), glacial acetic acid, zinc sulphate, zinc chlorid, silver nitrate, camphor, menthol, laudanum, canabis indica, morphin hydrochlorate and sulphate, atropin sulphate, cocain hydrochlorate, bismuth subnitrate, bismuth carbonate, capsicum, ipecac, all ordinary snuffs.

Although the disease had been subject to considerable study, especially during the last 30 or 40 years, very little had been determined in connection with its etiology except that the pollen of certain plants seemed to be instrumental in its production. To this were added a special predisposition on the part of the patient and an abnormal condition of the nose, which were accounted sufficient by teachers and text-book writers. The role of bacteria had been announced by Helmholtz[3], supported by Weil[4], Axillos[5] and others and disputed by Thost[6], Heymann and Matzuschita[7] and others who made extensive experiments. Blackley[8] who was the greatest exponent of the pollen theory enunciated by Elliotson[9], made an extensive study of the relation of pollen to hay-fever and determined

the number of pollen grains per cubic foot under various conditions.

It was Dunbar, however, who was the first to apply modern methods to the study of hay-fever, with tangible results. Differing from others who were content to examine the pollen in the atmosphere, he conceived the plan of subjecting predisposed individuals to the action of pollen grains during the quiescent stages of the disease. His experiments are at present well known. How he determined that the pollen grains would thus excite paroxysms in the predisposed, while the controls were unaffected. How, by classical and logical steps of the investigation the artificial hay-fever was produced by the administration first, of pollen of certain plants, second, of filtered solutions of this pollen in tears, nasal secretions, blood serum, saliva, etc. How the absolute non-toxicity of the pollen or of the solution of its active agents for non-predisposed individuals was established. Finally how a very violent reaction follows a subcutaneous injection of pollen toxin in predisposed individuals, while none occurs in controls.

Dunbar's further work in developing an antitoxin was an important event in therapeutic research consequent upon his investigations; its value in artificial hay-fever was easily established.

These experiments which have been accepted by various observers have been confirmed and extended, especially in the Hygienic Institute at Hamburg, under Dunbar's directions. Kammann[10] determined that the poison was a toxalbumin which was thermostabile, antagonistic to alkalies and not completely destroyed by enzymes like pepsin and trypsin. Liefmann[11] concludes the report of his observations with the following:

1. The occurrence of hay-fever and the presence of pollen in the air are two simultaneous congruous observations, insofar as the beginning and end fall together.

2. The factors which influence the number of pollen grains in the atmosphere follow the clinical picture, so that the curve showing the pollen count in the air agrees with the general course of the disease.

3. The heretofore unsettled question as to whether the quantity of pollen grains in the atmosphere is sufficient to cause the symptoms of hay-fever may be answered in the affirmative.

Lübbert[12] publishes a list of plants whose pollen toxicity and nontoxicity for hay-fever has been established.

The pollen of the following plants* has been found nontoxic: Common lilac, common iris, crocus, English plantain, common plantain, scabious, bitter-sweet, deadly night-shade, wild tobacco, black mullein, bindweed, pansy, blue-bell, wooly mullein, cow parsnip, coriander, common carrot, spotted hemlock, elder, common flax, lily, tulip, narcissus, hyacinth, squil, wood rush, dock, sorrel dock, heath, maple, English cherry, mock orange, Japanese quince, English meadow sweet, water avens, rose (7 different varieties), dog rose, bramble, corn poppy, linden, oriental poppy, common poppy, peony, monkshood, European globe flower, buttercup, pasque flower, anemone, purple foxglove, rock cress, wild geranium, meadow geranium, high mallow, wild mallow, sharp leaf mallow, hollyhock, marshmallow, laburnum, St. John's wort, burdock, common dandelion, mountain arnica, wild chamomile, milfoil, common wormwood, sunflower, garden marigold, spurge, Scotch pine, mountain pine, common nettle, alder, American white birch, English oak, willow, European yew, club moss.

The pollen of the following plants has been found toxic: Rye, cultivated oats, barley, oat grass, rice, reed, mountain reed, Haller's reed, orchard grass, blue grass, cotton grass, dog's tail grass, reed canary grass, ray grass, velvet grass, meadow foxtail, turfy hair grass, quick grass, meadow fescus, grand fescus, wheat, soft chess, common European honeysuckle, lily of the valley, Solomon's seal, common evening primrose, mustard, thistle, ox-eye daisy, golden-rod, (3 varieties), corn flower, chrysanthemum, aster, Indian corn (maize), sedge (7 varieties), white orach, great ragweed, bitter weed or hog-weed, ambrosia (ragweed, 2 varieties), burweed, ivy, common spinach.

Having established the value of antitoxic serum in experimental hay-fever, the remedy was exhibited during a portion of 1903 and the whole of last year in cases of hay-fever all over the world. In the main, good results have been reported, far better than from any other remedy previously administered. The results were particularly good when it is consid-

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*The botanical classification used by Lübbert is not current in this country. As far as possible the common names were determined from the botanical names which he gives; in other cases the German names have been translated.

ered that it was used helter-skelter by all sorts of physicians as well as patients without reference to the associated conditions. Doubtless many, among whom I must include myself, used the remedy for cases which were not hay-fever, but which presented symptoms, appearing during the hay-fever season, which simulated those of the disease. What a variety, then, of different conditions conglomerated under the lay term, hay-fever, must have been subjected to the serum treatment? How important, therefore, was it that the therapeutic side of the question should be weighed carefully in the light of accurate clinical observation and test.

Reports confirmatory of the claims made by Dunbar have been made by Glegg[13], Mayer[14], MacCoy[15], Somers[16], Prausnitz[17] and Stein[18].

Somers arrives at the following conclusions after a considerable experience:

1. The serum produces prompt and positive amelioration of the symptoms of fall hay-fever in the majority of cases. 2. In a smaller number this favorable result is soon accompanied with complete disappearance of the affection. 3. Where slight or no action is seen after its use, pollen as an etiologic factor does not predominate. 4. When results are obtained, it favorably influences all the manifestations of hay-fever. 5. When given during the attack, irrespective of its severity, it produces marked palliation rather than absolute cure. 6. Its effect on future attacks remains as yet unknown. 7. Serum in powdered form is slightly soothing to the nasal mucosa, has but little effect on the other symptoms of the affection and in occasional cases it may act as a direct irritant. 8. As a result of larger experience, especially with hay-fever occurring at other times of the year, it may become necessary to modify some of the opinions in regard to this antitoxin.

Sir Felix Semon[19], who is universally known as one of the most conservative as well as observing of laryngologists, from personal investigation of eight cases, admits that the serum treatment gave relief in some and appeared to have acted beneficially certainly in postponing the occurrence of the attack in others, and that these results might possibly have been more marked if the applications had been made with more frequency. Two of his patients stated that the hay-fever period had been made more tolerable than on previous occasions.

But one paper has appeared which in a marked way contradicts either the findings or the claims of Dunbar. Fink[20] presents objections which are rather polemic than convincing. He argues against Dunbar's theory of pollen toxin by showing that cases of hay-fever occur when but few or no pollen grains are found in the air, when the grasses are not flowering. He is encouraged in his view by the fact that the toxin had acted (as quoted by Sir Felix Semon in one case) where no hay-fever had previously been present. He also lays great stress upon the fact that Möhr[21] succeeded in preventing hayfever during a railroad journey by means of an apparatus which prevented the pollen from passing into the nose. According to Fink, this disproves the theory because the patient failed to acquire the usual paroxysms through the agency of the conjunctiva. He reports three cases in which the use of the serum was without good result; in one case the artificially produced hay-fever had been relieved by the antitoxin —a living example, he thinks, of the false results of laboratory research when subjected to clinical experience! All of which seems very similar to what was presented in opposition to the diphtheria antitoxin.

Following this, Fink discourses favorably upon the theory that the disease is a manifestation of neurasthenia, admitting that various patients have an idiosyncrasy for certain plants! He believes that the casus morbi of the disease is the antrum of Highmore and that the ocular and other remote symptoms are of a reflex character. Finally he finds in aristol the remedy which when applied to the mucosa of the antrum cures all forms of coryza and hay-fever. Perhaps the same rigid scrutiny manifested in opposing Dunbar's theory and results would be followed by as positive objections to his own conclusions as he found to Dunbar's.

My own experiments began in the summer of 1903 with some toxin sent to me by Prof. Dunbar. Several tests were made to ascertain whether or not there would be any reaction. But one of the cases remained sufficiently long under observation to fulfill all the conditions of the test. This case will be reported more at length. Another that of a young medical student, who had been in bad health, was treated in the following way: For five successive days a simple salt solution was dropped into his nose as well as into my own. On the sixth day the toxin was used resulting in violent reaction in

his case, while there was none in mine. The following day
the toxin was again injected with the same result. In this
way the element of suggestion was entirely eliminated for the
patient did not know but that the toxin was used from the
very first day.

Cases will not be reported here in detail particularly as the
list subjected to this treatment has now become very large.
One thing was manifest early in these studies, viz.: that there
were other features to be considered besides the paroxysms—
that there were other things that required treatment. It is
not to be supposed that an exciting cause affecting the blood
vessels so positively would fail to call into action certain other
agencies which would continue even after the paroxysms them-
selves would cease or which would most decidedly influence
them. Moreover, it must be admitted that the nasal mucosa
of hay-fever patients is subject to the various affections which
attack it during the intervals of the paroxysms. On the other
hand, there are often found conditions of the nose which oc-
casion no marked symptoms during the quiescent stage, but
which makes their presence felt at the period of the attacks.
Then again there are circumstances which modify the appli-
cation of the remedy or prevent its good effect. A large spur
or a narrow or irrgular nasal orifice may interfere with its
application especially when used by careless hands. Besides
this, it is just possible that the state of the mucosa or of the
secretion may have much to do with the taking up of the
agent. Many patients think that they may act with impunity
in view of the fact that they have a specific at hand. Finding
that it is not equal to the unfavorable circumstances to which
the patient subjects himself, it is discarded. Again and again
has it been observed that the serum proved to be efficient under
proper administration when it had been thought to be useless.
As with every other therapeutic agent, it must be used with
intelligence and with due consideration of the attendant con-
ditions.

The following grouping is clinically made: .

1. Typical cases of rose-fever, or German hay-fever.

These cases do better than any other variety, probably be-
cause the serum heretofore used has been prepared by immuni-
zation with toxin from the pollen of rye and other gramina.
In every case there was relief after a few days from the symp-

toms of itching of the eyes, nose and palate, sneezing and nasal obstruction.

In one case, that of Mrs. K., the disease had continued almost uninterruptedly since May, 1902, with the superaddition of asthma which first appeared in October, 1902. As this was the first patient treated (in August, 1903), but little promise of relief was given. After a very few days, however, all the symptoms disappeared with the exception of the nasal obstruction. This was found dependent upon a chronic hypertropic rhinitis in which both inferior turbinates were involved. She still has mild attacks from time to time which come on with an acute coryza. Symptoms of hay-fever appear; under appropriate treatment the symptoms disapear within 24 to 48 hours, with the exception of the obstruction. A portion of the left inferior turbinate has been removed and when these attacks now come on there is only a moderate amount of obstruction on this side. In this case the use of the pollen toxin was followed by a positive reaction.

Another patient, Mrs. L. A., was suffering intensely when she presented herself, August 2, 1904. She stated that since May she had been suffering almost constantly with colds, sneezing, itching of the eyes, etc., and had had no relief from treatment whatever. Within two days after the administration of the serum all the active symptoms disappeared and she insisted on having the nose freed from obstruction. Accordingly the necessary operations were performed, despite the fact that she had been suffering from the paroxysms but a few days before. She has had no recurrence.

H. S. had suffered from rose-fever for many years with sneezing, itching of the nose, eyes and throat during the paroxysms and sneezing at all times during the year. Entire relief from the sneezing and itching speedily followed the administration and the sense of smell returned.

Good results occurred in three other cases of a similar character which presented nothing special.

2. Typical cases of American hay-fever with obstruction manifest only during the paroxysms. These all showed improvement, itching of the eyes, nose and throat and sneezing relieved in every case where the remedy was used under my direction. The patients, with but several exceptions complained that the obstruction persisted in spite of the relief from other symptoms. In several instances where the remedy had

only been used for about two days the patient passed from under observation (visitors at the World's Fair) so that it could not be determined whether or not they were relieved. Two patients who had been suffering for many years were entirely relieved of all symptoms.

3. Cases in which the serum has been used without benefit, but in which relief supervened upon proper administration. Doubtless this class will include a large number of patients, particularly those who used the remedy without medical direction. The average hay-fever patient feels that he is thoroughly competent to attend to his own case. He hears of the good results of the remedy and uses it in a skeptical self-satisfying, though improper way, and, finding it of no avail, discontinues it. Two such cases were relieved by having the serum properly used. One of these, a patient of ten years' standing, who had not found any relief whatsoever previously, took the remedy with him on an Eastern trip so as to be prepared for the paroxysms which were due within a short time. He used it during attacks for two days while on the railroad journey, found that the paroxysms were not influenced and discontinued its use. On his return to the city he was directed to use a very small quantity twice a day and was required to report daily for observation. It was soon found that very small doses given two or three times a day depending upon the severity of the paroxysms and upon .posure to pollen were entirely effective and all of his .toms disappeared with the exception of the obstruction   some of the nasal discharge which was somewhat irritating.

Another case was that of a physician who had used entirely too large a dose. The dosage being reduced, he was kept under observation and direction for a few days with positive results.

4. Cases in which the condition of the nose interfered with the action of the serum. Under this head are included the various cases in which good results were delayed, but eventually manifested. At times a considerable deformity or ridge or spur prevented the insufflation of the powder. In several other cases, the discharge was profuse, and the powder was probably washed away before it could become effective. In one case the vibrissae appeared so large and numerous that the powder failed to reach the mucosa until the patient was directed to insert the little metal instrument high up into the

nose. In another case, the nose was full of polypi which made it impossible for the patient to draw the powder up into the nose. A close investigation into points of this nature will doubtless overcome the lack of good results in many cases; certainly those who use the remedy without proper medical direction take great chances in this particular.

5. Cases in which the ordinary Pollantin was of no avail, but in which the serum produced by immunization with golden-rod and ragweed toxin was effective. This was most acceptably shown in two cases. In one the relief had been moderate with the ordinary serum and absolute with the goldenrod and rag-weed antitoxin supplied to me very kindly by Prof. Dunbar. The second case had absolutely no relief from the use of the Pollantin. Within a half an hour after the other variety of serum was used the relief was positive. This experiment was made in the presence of Dr. Dunbar. The patient's symptoms continued under entire control during the remaining portion of the hay-fever season. With the introduction of rag-weed and goldenrod antitoxin, we may confidently look for more satisfactory results, generally, in the treatment of the typical American hay-fever.

6. Cases of false hay-fever. Under this head I include three patients who were not benefited by the serum. Subsequent examination showed that they were cases of so-called vaso-motor rhinitis due to a nervous condition and not to pollen. Two of the cases have been relieved by proper therapeutics, and the other had so far resisted treatment.

7. Rose-fever of 1905. During May, 1905, three new cases have been under observation. In one case of 6 years' standing relief appeared within 48 hours. Later, symptoms again developed following a long automobile ride in the country. Since the establishment of the proper dosage, there has been no recurrence, although she now rides in the parks. Another patient essayed to use the remedy after the first day without medical direction. Relief followed for several days. After an undue exposure, she greatly increased the number and size of the dose, so that her nose was in a state of irritation. Relief appeared when proper dosage was established. The third patient has now no symptoms. In these cases the serum of last year was used. None of the cases treated last year have so far found it necessary to seek further treatment.

This list include all the cases treated last year and this

year which I consider remained long enough under attention to warrant a proper trial of the serum. It does not include several patients who remained from 1 to 3 days without experiencing relief. One of these patients wrote me that he found the serum utterly useless. The other two did not communicate with me again. In addition to these there were 5 cases for which the serum was prescribed and the patient not seen again. One of these has written that it was effective and another that it was without result. However, it is fair in considering the value of the remedy from the clinical standpoint to exclude cases of this character. In every case the dried serum alone was used.

As to the relief of individual symptoms the cases showed the following:

Itching of the eyes. Almost invariably relieved during the first two or three days without applications being made to the eyes. This is at variance with the experiences of some other observers.

Itching of the nose disappeared within two or three days.

Itching of the palate. Alleviated, but after a longer use of the serum.

Epiphora. Usually ceased within 24 hours.

Rhinorrhea. In most cases, relieved. In some cases, while other symptoms were removed this remained, but generally somewhat diminished. This appears to be accounted for on the score of vaso-motor paresis due in part to the hay-fever and in part to the local condition of the nose.

Nasal obstruction. In perhaps half of the cases, this was entirely overcome. In other cases it remained, though generally somewhat diminished. The nasal obstruction is so frequently dependent upon hypertrophies, spurs, ridges and deflections and upon vaso-motor paresis that it is not to be expected that any remedy which combats the toxin alone can entirely overcome this symptom.

Sneezing. Relief almost uniformly immediate.

Asthma. In but two cases was this symptom present during the attack. The serum seemed to have no special effect on the asthma directly, but as the other symptoms improved, the asthma likewise was benefited.

From these observations is therefore appears, first, that Dunbar's serum is effective against the distressing symptoms of the disease, in cases even where there is no proper direction

for the administration of the remedy. Second, that the probability of relief is tremendously increased by intelligent observation of the attendant conditions and by proper administration of the antitoxin. Third, that the antitoxin made by using the pollen toxin of rag-weed and goldenrod promises far better results in our American form of hay-fever than that which is at present used. Fourth, that the commoner symptoms of itching of the eyes, nose and palate, epiphora and sneezing are almost invariably relieved within a few days after the serum is properly used. Fifth, that other symptoms, such as rhinorrhea, nasal obstruction and the like which are frequently dependent upon attendant conditions may entirely disappear and in general will be somewhat if not altogether relieved.   Sixth, that there are more problems to be solved in connection with the influence of pollen in the production of hay-fever and perhaps other diseases will be admitted and that an important step forward had been made by Dunbar in this work, no one can deny.

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XXI.

OTITIS MEDIA MUCOSA.[1]

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In the following paper I have taken for consideration and report, the histories of a few cases that certainly belong to the exudative form of non-suppurative middle ear disease. In some of them there was a sero-mucous collection in the tympanic cavity while in others the exudate was purely mucous. Following this, the various classifications and subdivisions of non-suppurative middle ear disease, as given by our leading authors in their most recent pronouncements, are briefly reviewed, and some of their disagreements noted.

Case I. M. S. male, aet. 33, sailor, born in Denmark.

As the result of a cold in the head, has had, for one week, deafness and tinnitus (constant hissing) and blocked feeling in A. D. H. D. W. R. c/120. Tuning forks show trouble in the conducting apparatus. Great retraction and opacity of m. t., no l. r.; m. t. moderately congested. Eustachian tube opens poorly by catheterization, with sound of fluid in t. c. Mucosa of nose and naso-pharynx congested. Tube inflated and $AgNo_3$, gr. 20 applied to vault. Two days later no change; m. t. incised with escape of considerable stringy mucus. Two days later, still discharging mucus; H. D. W. 24/120. Two days later, m. t. closed and H. D. W. 30/120. Treatment stopped because of his ship sailing, but patient seemed in a fair way toward complete recovery. Treatment; incision once, repeated inflation and application of $AgNo_3$ to vault, and bougie used once.

Case II. W. S., male, aet. 38, horseman, born United States. As the result of a cold in the head, has had for two weeks deafness and tinnitus (rumbling), and blocked feeling in A. S.

Moderate quantity of fluid visible in t. c. when first seen, May 14, 1902. Eustachian tube opens poorly by catheterization, with bubbling of fluid, but bougie passes without difficulty. Tried inflation and treatment of vault twice before opening m. t., with but little effect. Incised drum membrane, May 23, June 5 and July 17, after which patient had no further trouble.

Case III. C. P., male, aet. 40, clerk, born in United States. One month ago without evident cause had pain in A. D. which was followed for two or three days by discharge; since then there has been deafness and tinnitus (hissing) with a blocked feeling; H. D. W. R. ½ inch. M. t. shows great retraction, marked irregular opacity, some irregularity of surface; l. r. diffused and irregular in shape. Eustachian tube opens poorly by catheterizing, with evidence of fluid in t. c.; effort to pass bougie failed. Patient hears better when lying down. Two treatments by inflatation, etc., made no lasting improvement, whereupon I incised m. t., with great immediate gain in hearing and lighter feeling in head. In three weeks there was again fluid in t. c.; second incision, with gain in hearing. Heard nothing further of patient. Probably no further trouble.

Case IV. Mrs. P., aet. 38, born in United States. As a result of washing her hair, has had, for five weeks, deafness and tinnitus (roaring) in A. S. and for the first two or three days moderate pain, which she thought was a toothache. H. D. W. L. ¼-inch. Eustachian tube opens easily by Politzerizing. M. t. very greatly retracted, no opacity; l. r. a central point of light. T. C. evidently nearly filled with exudate. M. t. was incised, and a large amount of mucus was cleared out by inflation. P. T. W. 6½-7. Six days later I re-opened it with escape of mucus, seventeen days later do., after which there was no further trouble, even in the face of a severe cold shortly afterwards. Treatment, besides three incisions, inflation and sol. of $AgNo_3$ applied to vault and mouth of tube. No special pathological condition of nose and throat, except that mucosa of vault was slightly hypertrophied, with slight excess of secretion there.

Case V. Mr. P., aet. 48, lawyer, born in United States; a so-called uric-acidemic. As a result of cold in the head, has had for eight weeks, deafness, stopped-feeling, with tinnitus (like insects) severe at first but less so at present, and for the past two weeks grumbling ("as if they might ache at any

time") in both ears. H. D. W. R. 22 inch. L. 14 inch. Right m. t. in about a normal position; considerable opacity; l. r. lessened and broken; left m. t. in about a normal position, very translucent; l. r. small and central; t. c. seems to be about 2/3 full of fluid. Right tube opens fairly well to catheterizing, with large mucous rales. Left tube—scarcely any air passes upon catheterizing, but, after incision, air passes freely upon Politzerizing. Several nasal polypi have been removed during the past month or two; still one or more in right middle meatus. Patient has attacks of vaso-motor rhinitis brought on by driving (exhalation from the horse). A good deal of secretion in nose, but not much in throat. Left m. t. incised at first visit 12/11, '01, with escape of considerable sero-mucus; polyp removed from right middle meatus. 12/13, great improvement; 12/17, incised again. 12/20, incised again, after which hearing was greatly improved. One month later, 1/27, '02, had a cold with pain in A. S. followed by a most profuse sero-mucus discharge. Perforation now closed. 2/20, left m. t. again incised. 4/14 reports having felt all right until last night; had pain in A. S.; fluid now visible in t. c. M. t. incised with escape of mucus. Seen once afterward and felt all right. Treatment—Incision five times, inflation, removal of polyp from nose, adrenalin spray, and AgNo$_2$ applied to vault and mouth of tube.

Case VI. C. K., aet. 41, in mercantile life, born in United States. As a result of cold in the head, had been deaf (no other symptom) in A. D. one week, in A. S. one day. H. D. W. R. and L. 5 inch. Both m. tt. show great retraction and opacity, no l. r. and while no fluid line is visible, there is an appearance suggestive of fluid in both tympanic cavities. Right tube opens with much difficulty upon Politzerizing, left tube opens rather easily. Inflation and adrenalin spray, the latter used at home for twenty-four hours, having failed to do good, the next day, 10/21, '01, bougie and catheter were used, still without relief. I incised right m. t. after which by Politzering, I blew out a considerable quantity of rather thin mucus, with great gain in hearing. 10/26, incised left m. t. with similar result. 11/7, right t. c. again full; m. t. incised. 11/11, do. 11/22, left m. t. again incised. Patient ceased coming 12/3. H. D. W. R. 20 inch, L. 42 inch. Treatment—Inflation, adrenalin spray, incision of right m. t. three times,

left twice; AgNo₃ applied to vault, saline laxative, Turkish baths, limited use of tobacco.

Case VII. F. K., aet. 19, student, born in United States. As the result of a cold in the head, has had deafness, tinnitus (like boiling water) and slight pain in A. D. two and a half weeks, deafness in A. S. one week. Tuning forks show some internal as well as middle ear involvement. H. D. W. R. C. L. 3 inch. Both membranes show marked retraction and opacity, and l. r., small, together with considerable congestion. In the left t. c. some appearance of fluid. Good-sized hypertrophy of 3d and 5th tonsils. Both tubes open easily to Politzerizing. Both membranes incised with escape of moderate amount of sero-mucus. One month later, the enlarged 3d and 5th tonsils were removed Two months later, no evidence of fluid in either t. c. H. D. W. R. ½ inch. L. 20 inch. Right ear was the one which had originally shown the most nerve involvement. Treatment—Incision of both drums once, inflation, removal of 3d and 5th tonsils. Later, strychnia and phospho-albumen internally.

Case VIII. A. F., male, aet. 45, salesman, born in United States. As a result of cold in the head has had for two and a half weeks deafness, tinnitus, autophonia, and stopped feeling in A. S. Hears his own breathing in this ear. Tube opens easily to Politzerizing. H. D. W. L. ¼ inch. Clear picture of fluid in t. c., which on incision proved to be largely serum, with small amount of mucus. Only the one incision was needed, the hearing returned to normal after a few inflations, and applications of AgNo₃ to vault.

Case IX. Mrs. D., aet. 48, born in United States. As a result of cold in the head, has felt for ten days deafness and stuffy feeling in A. S. H. D. W. L. c. Small quantity of fluid (probably largely serous) visible in t. c. Tube opens easily to Politzerizing. Fluid disappeared with simple inflation and AgNo₃ application to vault. Symptoms recurred five months later, but again yielded promptly to same treatment.

Case X. J. D., aet. 41, clerk, born in Ireland. Apparently as a result of a very slight cold in the head for five or six days, deafness and tinnitus, with autophonia and a plugged feeling in both ears, the onset being sudden. H. D. W. R. 5 inch. L. 7 inch. Right m. t., great retraction, marked irregular opacity, l. r. half size, tube opens with great difficulty to Politzerizing; left m. t. great retraction, moderate opacity

inferiorly, l. r. almost full size. Tube opens with moderate difficulty to Politzerizing. With bougie, inflation, arîd AgNo$_3$ to vault both ears recovered, but six weeks later had another cold, and A. S. showed evidence of fluid in t. c. Incised m. t. and blew out some very thick mucus. After another treatment had no further trouble.

Case XI. H. B., aet. 35, salesman, born in United States. As a result of blowing the nose too violently, has had, for five or six weeks, deafness and tinnitus (like hum of mosquito) in A. D. with numbness of auricle. H. D. W. R. 5 inch. M. t. shows marked retraction and is very translucent; l. r. small and marginal. Though no fluid line is visible, it looks as if there was fluid in t. c. Tube opens easily to Politzerizing. Rather excessive secretion from naso-pharynx. Faucial tonsils moderately enlarged. Treated by inflation, and applications of AgNo$_8$ to vault. During the treatment patient developed an acute inflammatory attack in the same ear. This subsided, fluid disappeared, and patient heard W. 5 feet after about two months. On account of the continued numbness of auricle I incised m. t. with escape of moderate amount of mucus, after which that symptom subsided.

Case XII. Mrs. B., aet. 34, born in United States. Without apparent cause, deafness and tinnitus in A. S. three years, in A. D. six months. Tuning forks show slight nerve involvement. Right m. t. shows considerable retraction and opacity; l. r. lessened; left m. t. shows great retraction and opacity; l. r. small. Both tubes fairly open to catheter. This case is mentioned briefly here because on two or three occasions, when catheter was used, small plugs of mucus have been dislodged from the right tube with temporary gain in hearing. But I have never seen fit to incise the membrane because on no other occasions have there been symptoms which would lead one to think of a collection of mucus in either ear.

The cases described up to this point are, perhaps, not unusual; most of them are not difficult of diagnosis and when the diagnosis is properly made treatment is usually attended with gratifying results. As much cannot be said of the following cases:

Case XIII. W. S., aet. 62, born in United States. In mercantile life. First seen 1/4, '96. Deafness and tinnitus in both ears some fifteen years. Previous to an attack of pneumonia, nine months ago, had occasional stopped-feeling in one

or other ear, which since then is constant in both. Has had
nasal polypi removed fifteen years ago, again six or seven
years ago, and there are now more or less of them in both
middle meatuses. H. D. W. R. o. L. ¼ inch. Cicatrices and
chalk deposits in both membranes, which respond very poorly
to Siegle. Both tubes open poorly to catheter, and bougie
passes only with great difficulty. Six years later, when under
treatment, there seemed to be fluid in both t. c.'s, which after
m. tt. were incised proved to be a very thick mucus; this con-
tinued discharging some days (at one time over a week) after
incision.   Following this the patient had a lighter feeling
in the head, but did not hear materially better. Radical work
in the nose was not allowed, so I had to be content with keep-
ing a breathing space open. An essential part of the treatment
in this case, the thing that really made his ears feel more open,
and temporarily improved hearing, was, besides repeated in-
cision, the introduction of large Eustachian bougies and leav-
ing them in place several minutes at a time. Patient later died
of malignant disease of either stomach or liver.

Case XIV. Mr. A., aet. 62, merchant, born in United States.
Without known cause, has had deafness and feeling of weight
in A. D. fifteen or twenty years. H. D. W. R. o. conv. 5 feet.
M. t. has a bulged appearance (as if from blowing the nose
too hard); great opacity, considerable congestion; no l. r.
Tube opens very poorly to catheter. 10/11, '01, (first visit).
M. t. was incised, after which inflation brought out a mod-
erate quantity of very thick mucus; 11/11, again incised;
12/13, do., with expulsion of a large quantity of thick mucus;
12/21, do.; 12/26, do.; 12/28, edges separated and cavity
emptied again; 12/31, again opened. 1/3, '02, do.; 1/6, do.;
1/13, do. This last opening did not close until 1/30, and in the
meantime there ·was pretty constant escape of mucus from
the ear. I now began the use of a large bougie once in five
to seven days, leaving it in the tube five to ten minutes, and
by this means the hearing was kept as good as by repeated
incisions, but no permanent result was obtained, and patient,
although improved, after six months of faithful treatment
ceased his visits. As complicating, and perhaps causative,
conditions, were a suppurating frontal sinus and nasal polypi,
while the patient's general health made a radical operative in-
terference very undesirable. Treatment consisted of—incis-
ion twelve times, Eustachian bougie(large size) and inflation

with catheter, removal of nasal polypi, washing out of frontal sinus. Adrenalin solution, 3% camphor-menthol oil, and other things were injected through the catheter, Eustachian tube and t. c.

Case XV. Mr. W. M., aet. 58, in shipping business, born in United States. Without known cause, unless it was "the use of a spray in the nose," has been dull of hearing one week, with a dull ache (relieved by pulling the tragus forward) in A. D.; the trouble seems worse morning and evening, passing off during the day. H. D. W. R. 18 inches. Some congestion of canal walls; m. t. shows marked retraction, moderate opacity, l. r. small and dim. Tube almost too open, and air enters t. c. with a perfectly dry sound. Inflated twice, stopped atomizer, and ordered albolene in compressible tube, after which there was no further trouble for nearly eight months, when on 12/31, '03, he reported sensations in the same ear similar to those of the previous attack. Has considerable mucous secretion from nose and naso-pharynx. 1/8, '04. For the last twenty hours has had some pain in A. D. for which I ordered leeches, dry heat, and applied $AgNo_3$ gr. v.—oz i, to vault and tube-mouth. This attack subsided under inflation and application of $AgNo_3$ to vault, until on 3/4 he reported that for a week there had been a plugged feeling in the ear; m. t. inflamed, but there was no pain. 3/12, H. D. W. up to 2¼ inches. 3/17, ear again more stuffy. By using catheter and the Politzer bag as an exhaust drew some thick mucus out of the tube with improvement in the feeling of the ear. 3/18 and 3/19, do.; 3/24, I incised m. t. and with Politzer bag blew out a large piece of solid mucus. By 3/28, the stuffy feeling had returned, and with the catheter I blew out another large piece of mucus through the opening made last time. Injected through the catheter, Eustachian tube and t. c. 3% camphor-menthol oil as I had already repeatedly done. 3/29, ear has felt stopped up all day; some tenderness over the region of the Eustachian tube; m. t. much reddened. Did nothing but apply $AgNo_3$ gr. 20 to tube mouth and ordered dry heat. 3/30, patient reports severe pain early part of last night, followed by free discharge. 3/31, more or less pain throughout yesterday, worse last night. Ear discharging profusely; slight tenderness at mastoid apex. Almost continuous, loud, pulsating tinnitus. 4/1, pain and tenderness less. 4/2, discharge profuse; very little tenderness; complains

of a continuous dull ache, and continuous pulsation. 4/5, almost no change except that today temperature rose to 101.5°. 4/6, temperature, 3 p. m., 100°. Dr. Gorham Bacon saw him with me this evening and although discharge was free, advised additional opening of m. t. which was done early the following morning as an "internal Wilde's" incision. 4/9, There having been no change in the symptoms the mastoid was opened. There was found an astonishing amount of pus and dead bone, involving the tissues around the antrum, uncovering the lateral sinus, extending far posteriorly, as well as to the apex, which came away in one piece. Healing of the wound was uneventful, dressings ceased 6/3. The hearing has never improved in this case as we expect it to after mastoid operations. At present H. D. W. ¼ inch-½ inch. No trace of mucus in Eustachian tube or t. c.

Case XVI. Mr. M. H., aet. 41, salesman, born in Germany. As a result of "catarrh," progressive deafness in A. S. one year, beginning at that time with severe earache lasting three or four days, for which he says m. t. was incised but without discharge other than blood immediately following the incision. H. D. W. L. 1½ inch, P. Pol. 12 inches. M. t. shows very great retraction, great opacity, l. r. small and central. Slightly congested, responds scarcely at all to Siegle. Eustachian tube opens with the greatest difficulty to Politzerizing. In A. D. for the past three or four months patient has felt what he described as a drawing or pulling sensation, which is increasing. H. D. W. R. 5½ feet. M. t. shows great retraction and opacity; l. r. small and central; considerable congestion of malleus and attic region. Moves very little to Siegle. Eustachian tube opens with difficulty to Politzerizing. Patient says he is very largely a mouth-breather, due in his judgment to contracted condition of the upper part of throat, the result of removal of adenoids and uvula four years ago. The nostrils seem sufficiently open. The whole naso-pharynx and pharynx seem contracted, with reddening and thickening of the mucosa, this condition extending markedly to the epiglottis and the false chords. It was not until the patient had been more or less regularly under my care for five or six months that I suspected the presence of mucus in the t. c., when, owing to the continued stuffy feeling, the tendency of the hearing to retrograde, and the somewhat suspicious sounds when using the bougie and catheter, I, on 11/15, '02, incised the left m. t.

and blew out a large quantity of very thick viscid mucus, with marked improvement in hearing and feeling. On 1/7, '03, I made this note: "Upon introducing the finger into the naso-pharynx there was a sensation as of adhesion between the surfaces, which seemed to separate with a tearing sensation, and some bleeding, but was followed by a much more open feeling for breathing, etc. 1/4, re-opened left m. t.; 3/9, repeated the introduction of the finger into naso-pharynx with the same sensations and the same good effect. 4/1, severe pain in A. S. the past twenty-four hours. (I had not seen him for six days). M. t. much inflamed. I incised it and blew out thick mucus. Inflammation quickly subsided. 6/10, again incised m. t.; 7/1, do. 10/22, severe pain last night; m. t. much inflamed; incised; pain and tenderness gone by 10/24. 11/24, re-opened m. t. with escape of thick mucus, which continued to run for three or four days. 12/30, four or five days ago had severe pain in A. D. for one day, and since then moderate pain and slight discharge. M. t. much inflamed and shows a minute perforation which I at once enlarged, with immediate relief of pain. 1/7, '04, ill with a severe cold; after a few days pleurisy developed. A. D. still discharges slightly. Extreme deafness in both. 2/10, all his symptoms have greatly improved, H. D. W. R. 12 inches, L. 4 inches. This was the last I saw of patient. It is evident that the results of treatment, as to permanency, were very unsatisfactory. Just what was the condition in the naso-pharynx, which was probably the underlying cause of his ear troubles, I do not know. A distinguished colleague, and fellow-member of this society, to whom I sent him for an opinion, agreed with me.

Case XVII. Mrs. D., aet. 44, born in United States. Was first seen 11/8, '01. As the result of a cold in the head, she has been deaf, with rather loud pulsating tinnitus, and stopped feeling in the right ear for three weeks. H. D. W. R. 1¼ inch, L. 14 inches. Right m. t. shows great retraction and opacity, except for a large cicatrix lying inferiorly in which is a small l. r. Left m. t., shows great retraction, and opacity, l. r. small. Air entered right t. c. very poorly until after incision (in posterior part of cicatrix) when it went through freely by Politzerizing and forced out considerable viscid mucus. P. T. W. R. 22 inches, L. 12 inches. After a second inflation a few days later H. D. W. R. 22 inches, L. 18 inches. Returned two months later, 1/25, '02, with evidence of fluid in right t. c.

and H. D. down to R. 2 inches, L. 8 inches; after incision of right m. t. and inflation, R. 5 inches, L. 12 inches. 4/14, left m. t. incised. 5/16, right m. t. considerably inflamed. 5/22, incised it. 8/13, incised left m. t. H. D. W. ᴋ. 2 inches, L. ½ inch. 10/7, H. D. W. R. 1 inch, L. 3 inches, incised right m. t. 10/30, both dull, H. D. W. R. and L. ½ inch. Incised both, P. T. R. 4 inches, L. 2½ inches. 12/1, re-opened both. 12/8, re-opened left. 1/13, '03, re-opened right. 3/27, both ears have been comparatively free from crackling since last seen, H. D. W. R. 8 inches, L. 14 inches. 5/15, hearing down again, R. and L. 3 inches. Incised both membranes. 7/22, do. 7/31, incised left. 11/7, do. 11/12, incised right. 1/23, '04, incised left. 3/12, incised right. 4/5, incised left. 4/11, do. 4/29, both. 5/14, left. 5/20, right. 5/31, left. 9/6, both. 10/14, left. 11/4, pain twenty-four hours in left, membrane inflamed. 11/10, incised left. 11/16, right. 12/1, right. 12/20, left. 12/29, H. D. W. R. and L. c., incised both. 12/31, both still open, A. D. dry, A. S. discharging muco-pus. 1/5, '05, A. D. open and dry. A. S. closed. 1/10, A. D. still open, incised left. 1/20, incised left. 1/30, again incised left, in which there is constant rather loud pulsating tinnitus, and m. t. considerably inflamed. 2/2, A. S. still open and dry. Incised right, which is now moderately inflamed and pulsating. H. D. W. R. ½ inch, L. 1 inch.

I do not need to tell you how unsatisfactory treatment has been in this case. The patient is as badly off, perhaps worse than at any time during the past three years. There have been times when the condition was quite comfortable for a longer or shorter period. The symptoms have been in brief—deafness, at times pulsating tinnitus, expressed by the patient as "thumping in the ear," at times autophonia, occasionally crackling, when she lies down feels as if something were moving in the ear. No dizziness, no interference with cerebration. Has a good deal of secretion from nose and naso-pharynx. Treatment has consisted of frequent repeated incisions, (right 18 times, left 23 times), and not one of them a dry tap! Inflation with catheter and with Politzer bag, bougie, AgNo₃ applied to vault, AgNo₃ injected through the Eustachian tube into t. c. and out into the external canal, and into t. c. from the external canal and forced through into the throat. Syringing with saline, etc., through catheter, Eustachian tube, t. c. and out the external canal, and from the canal through t. c.

Eustachian tube and out through the nose. General tonic and climatic treatment. A case of "Help Wanted!"

Case XVIII. Mr. J., aet. 55, merchant, born in United States. Apparently as the result of using the nasal douche, has had for between two and three months deafness and tinnitus (constantly, but of varying character), and great feeling of pressure in A. S. Same feeling to a very slight (almost inappreciable) extent in A. D. I first saw him 6/24, '04. At that time he had been under treatment by his family physician for two months. H. D. W. R. 14 inches, L. c. Right m. t. position about normal, marked irregular opacity, l. r. lessened. Drum moves freely to Siegle. Eustachian tube opens poorly to catheter, quite well after bougie. Left m. t. great retraction, scarcely any opacity, l. r. small and central. Drum moves very little to Siegle. Eustachian tube does not open to catheter, and I failed to get bougie more than part way through, but even this permitted air to pass quite well, and without distinct sound of fluid in t. c. Some enlargement of fifth tonsil —general redness of nasal and naso-pharyngeal mucosa, only slight excess of secretion from naso-pharynx. Treated with bougie, inflation, massage, and application of AgNo$_3$ to vault at frequent intervals up to 9/6, with distinct gain in hearing, up to W. R. 28 inches, L. 20 inches, but there was constant tendency for the hearing to grow worse, and with it a return of the feeling of pressure. I incised left m. t. with escape of considerable viscid mucus. 9/23, again incised left m. t. 11/18, do., mucus thicker than heretofore. 11/26, do. and instilled AgNo$_3$ gr. 1¼ to oz. 1, into t. c. 11/30, patient reports that he had pain for several hours after last treatment. Sensation of fullness seems now almost worse than before. 12/7, still has most annoying sense of fullness; incision gave vent to a considerable amount of sero-mucus (much thinner than before). 12/14, has had great relief. 12/22, A. S. again much stopped up. Incised m. t. and blew AgNo$_3$, 1¼ gr. to oz. I through catheter into t. c. Ordered muriate of pilocarpine gr. ⅛, t. i. d. by mouth. 12/29, A. S. again stopped up; H. D. W. R. 2 inches, L. c. Again incised m. t. and injected silver solution through catheter into t. c. 1/19, '05, patient has still the feeling of fullness, but the intense pressure is absent; W. L. c. P. T. (incision, bougie, and catheter inflation) W. L. 6 inches. Not seen since that date, but heard by telephone that he was hearing and feeling much better. Here

is another case in which I have made but little progress toward permanent cure. Treatment has consisted of repeated incision (8 times), bougie and inflation (catheter and Politzer), massage, AgNo₃ applied to vault, injected through Eustachian tube into t. c. and from external canal into t. c. and down through the Eustachian tube. Is still under treatment. More "Help Wanted!"

Thus there have been 11 unilateral cases and 7 in which both ears were involved, 18 cases and 25 affected ears.

Etiological factors have been, cold in the head, 9 times; nasal polypi, 2; vaso-motor rhinitis, 1; hypertrophied 3d and 5th tonsils, 1; hypertrophied 5th tonsil, 1; blowing nose too hard, 1; "catarrh," 1; nasal douche, 1; use of atomizer, 1; washing hair, 1; no evident cause, 3.

Symptomalogy. Deafness, 25; tinnitus, 16; blocked feeling, 15; autophonia, 4; pain (usually slight), 5; numbness of auricle, 1: appearance of membrane—great retraction, 17; moderate retraction, 4; no retraction, 3; bulged, 1; great opacity, 12; moderate opacity, 8; no opacity, 5; moderate congestion of m. t., 5; l. r. absent, 11; l. r. ½ size, 9; l. r. full size, 5.

Eustachian tube narrowed, 10. Eustachian tube not narrowed 15. Appearance of fluid through m. t. 9. Hears better lying down 1. Feels something move in ear when lying down 2.

M. t. not incised, 6. Incised once, 6. Incised twice, 4. Incised three times, 3. Incised five times, 1. Incised seven times, 1. Incised eight times, 1. Incised twelve times, 1. Incised eighteen times, 1. Incised twenty-three times, 1. Much improved or cured after relatively short courses of treatment, 13.

A striking feature of this group of cases is their proneness to intercurrent acute attacks of middle ear inflammation, eight or ten such being recorded, one of these going on to extensive mastoid disease. In considering the position of such a group of cases in the general classification of non-suppurative middle ear disease, it is evident that they belong to the moist or secretory type. But in glancing through what the authorities have to say on the subject, I was impressed with the fact that virtually none of them has described such cases as some of those I have outlined to you in detail. The nearest to it is a case described at some length by Burnett in his text-book published in 1884. With your kind forebearance I should like

to run over with you some of the classifications of chronic non-suppurative middle ear disease.

Bishop (last edition) describes two classes—Hypertrophic middle ear catarrh, and adhesive middle ear catarrh (commonly called sclerosis). Hovell says, chronic catarrh appears in two principals forms: in one, the process is mainly catarrhal, i. e., accompanied by more or less abundant secretion, in the second, the process is marked by hyperplasia of the mucous membrane, adhesions between various parts (sclerotic form), and thickening and condensation of tissues. Barr—1. Exudative catarrh of the middle ear (synonyms—mucous or muco-serous catarrh of the middle ear; catarrh of the middle ear; otitis media catarrhalis; obstruction of the Eustachian tube). 2. Non-exudative, or interstitial inflammation of the middle ear, (synonyms, chronic dry catarrh, adhesive processes in the middle ear; proliferous inflammation of the middle ear; chronic catarrh of the middle ear; sclerosis of the middle ear).

Grayson—Chronic catarrhal otitis media.

Cheatle, in Posey and Wright—

(a) Hypertrophic catarrh. (1) Chronic catarrh of the Eustachian tube. (2) Chronic catarrh of the middle ear tract.

(b) Atrophic catarrh or sclerosis.

(c) Changes in the lining membrane due to variations in pressure.

(d) Changes in the lining membrane due to deficient blood supply.

Dench in DeSchweinitz and Randall. Non-suppurative inflammation of the middle ear may be either hypertrophic or hyperplastic (meaning what is ordinarily known as sclerosis of the middle ear). Bacon—Chronic catarrhal otitis media should include cases of *secretive catarrh,* in which there are considerable hyperemia and swelling of the mucous membrane, followed by the formation of adhesions and anchyloses of the ossicles, as well as cases of *sclerotic or interstitial inflamation,* which is confined to a limited portion of the tympanum, usually the region of the fenestræ.

Holmes, in DeSchweinitz and Randall—Various classifications (of middle ear disease) have been attempted; the most practical is a clinical basis; where we divide the inflammations into (a) sero-mucous form of middle ear catarrh; otitis media catarrhalis acuta; secretory form of middle ear catarrh; otitis media serosa; catarrh of t. c. and Eustachian tube. (b) Proliferous inflammation of middle ear. (c) Muco-purulent in-

flammation of middle ear. (*d*) O. m. p. a. (*e*) O. m. p. c.
Jacobson and Blau, 3d edition—Chronic middle ear catarrh; in-
cluded in this term are a large number of disease processes
which differ from one another pathologically and clinically. It
seems practical to divide them into two large groups—*moist*
(secretory), and *dry.* The latter result from the former.

Dench, text-book, last edition. Chronic catarrhal otitis
media—under this head various affections of the tympanum
have been described. The selection of this name is particularly
unfortunate, since it conveys the impression that the disease
is really a complicating lesion of some condition in the nose
or naso-pharynx. Catarrhal inflammation is a term applied
to a simple inflammation of any m. m. It may occur in the
ear or elsewhere, constituting a primary disease entirely inde-
pendent of any lesion in the upper air passages.

In passing, let me quote from Grayson: "With our pres-
ent knowledge of the pathology of catarrhal affections of the
mucous membranes and of the tendency of this form of dis-
ease in one region to extend by continuity of tissue to others,
it may be stated with little fear of contradiction that chronic
catarrh of the middle ear is invariably secondary to a similar
pathological process in the nose and naso-pharynx. In view
of the anatomical and physiological relations of the nose,
throat, and ear a primary and independent chronic catarrh of
the last-named cavity is inconceivable."

Dench divides cases into (1) A hypertrophic inflammation,
with a swelling of the mucous membrane of the t. c., due to a
chronic venous congestion; as a result, the glandular elements
produce an excessive amount of secretion. (2) A hyperplas-
tic inflammation—the new tissue being firm and fibrous, secre-
tion diminished, walls of blood vessels thickened, and a true
sclerosis results.

Burnett—Chronic catarrhal inflammation—two chief forms,
1 *a*) the *secreting* or *moist,* (1 *b*) *the non-secreting* or *dry*
form. He says: "To these aspects of the chronic disease, dif-
ferent names, and in some cases vastly different natures have
been assigned."

Politzer, last edition:

1. Middle ear catarrh—(Ot. med. catarrhalis).

a The secretory form of middle ear catarrh. (Synonyms—
sero-mucous middle ear catarrh; Ot. med. serosa; exudative
middle ear catarrh; tubo-tympanic catarrh.

b.   *Catarrhal adhesive processes in middle ear.*   Chronic
middle ear catarrh.   (Synonyms—Ot. med. cat. chronica).

Allied conditions—narrowing of Eustachian tube.   Otoscle-
rosis.   Our O. m. c. a. he classes as the first of the

II. Muco-purulent inflammations of the middle ear mucous
membrane.

Walb, in Schwartze's text-book:

2.   Catarrh of tympanic cavity—

a.   Acute catarrh (O. m. c. a.)

b.   Chronic catarrh of t. c. (O. m. c. c.)

1.   Simple form (O. m. c. c. simplex).

2.   Hypertrophic form of chronic catarrh (O. m. c. c. hyp.)

3.   Sclerosis of mucous membrane of t. c.

As intimated above I fail to find here any accurate descrip-
tion of the cases under consideration, and a part of the object
of this paper is to call your attention afresh to the paper by
Alderton on "Otitis Media Mucosa" read before this Society
and published in the *Medical News* for September 21, 1901,
and I wish to extend to him the credit, so far as my investi-
gations go, of having first accurately described this condition.
My observations for the most part agree very closely with
his, although differing in some minor points.   All of my cases
occurred in adults—one was only 19—the others between 33
and 62.

As opposed to Alderton, I practically never found tenderness
to the touch of the parts around the auricle.   I have seen
throbbing (pulsating) tinnitus in only two or three cases.
Again, none of my cases spoke of difficulty in concentration or
of cerebration.   I found autophonia in relatively few—Alder-
ton in most of his cases.

Alderton says, "the patient is unhappy, fearful for the fu-
ture, and unable to attend to business."   Beyond the point
of being "unhappy" my patients have not been disturbed in
this way.

I have had no complaint of dizziness, as Alderton has.
Again Alderton finds "the m. t. in about its usual position—
sometimes bulged."   In a large proportion of my cases there
was "great retraction" of m. t., bulging in only one.   The
congestion of the m. t. spoken of by Alderton was present
in only a small proportion of my cases.   There was, as Alder-
ton says, no fluid line discernible in the pure mucosa cases—
it was seen in some of the sero-mucous cases.   What Alderton

says about the results of changing the position of the patient's head, and of the results of inflation before and after incision, as well as of the difficulty of emptying the t. c., is absolutely borne out by my observations.

The results of treatment are eminently satisfactory in a considerable proportion of cases—seemingly not in as large a proportion of my own cases as I am led to believe has been the case with others. With Aldgerton, again, I would give easily the first place to incision and evacuation of the t. c. together with inflation and suitable treatment of the naso-pharynx.

To revert for a moment to the general classification of the subject, in view of what I have quoted to you from our leading writers on Otology, again in view of the fact that sclerosis of the middle ear is being, perhaps has been, withdrawn from the category of middle ear catarrh so called, I would venture to ask whether or not the time may not be ripe for some new classification or subdivision of the general group known as non-suppurative middle ear disease. I would further suggest that it might come within the province of such a leading society as this to give out, after a full discussion of the subject at some one of our general society meetings, some authoritative utterance upon the subject.

130 Montague Street.

XXII.

A CASE OF OTOGENOUS INFECTIOUS THROMBO-
PHLEBITIS WITHOUT FEVER.*

By Dr. G. Alexander.

Cases of mild infectious thrombophlebitis of the lateral sinus are rare, and therefore I am justified in reporting this one on account of the wide spread destruction and large thrombus found at the operation, which was in distinct contrast to the mild course of the entire disease.

Michael G., 45 years old, day laborer, at Dornbach, Lower Austria.

Diagnosis—Otitis media suppurativa subacuta dextra. Osteoperiostitis processus mastoidei dextri. Thrombophlebitis sinus lateralis dextri.

History—Patient has had trouble with his ear since last August, dating apparently from a cold (lying on damp ground). Deafness, earache, headache since beginning of trouble. Since beginning of October, has had aural discharge, with continuance of pain. No fever, temp. 37°—37.4°. The patient's condition is good with the exception of some spontaneous pain behind the ear. Appetite good. No chill.

Status . praesens—Well nourished, strong individual. No changes in abdominal or thoracic organs.

Aural Findings—Skin of right meatus macerated; fetid pus deep in canal. After cleansing, it is found that the meatus is narrowed as much as possible in its depths, and no details of the drum are visible. Behind the auricle and mastoid is a tumor the size of a gulden (fifty-cent piece. Trans.); the skin over it is slightly stretched, but otherwise unchanged. The tumor is painful, both spontaneously and on pressure, and there is distinct fluctuation.

Left drum slightly cloudy; hammer vessels injected. Weber on right side. Rinne on right side negative with considerable

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shortening of air conductivity and lengthening of bone. On the left side the difference is slight; some lengthening of bone conduction. Perception of deep tones slightly diminished on both sides. Watch and acoumeter positive by bone.

Hearing.	Right.	Left.
Speech	1.0 m.	7.0 m.
Whisper	0.0 m.	1.0 m.
Politzer's acoumeter	0.0 m.	1.0 m.

Fundus oculi normal; no pathological constituents in urine. Temp. 37°—37.4°.

Operation in quiet chloroform narcosis, (Alexander) Nov. 7, 1904. Typical cutaneous incision, and opening of mastoid. Latter softened and filled with pus. In order to remove diseased portion, the entire mastoid process had to be removed. As a result there was a large bony defect of the middle and posterior cranial fossa, laying the dura bare for the space of a five kronen piece (about one dollar. Trans.) The dura is everywhere covered with grayish-red granulations to a height of 3 mm., from between which wells up a large amount of fetid pus. The dura near the sinus, as well as the wall of the sinus, is considerably changed (a second, horizontal incision, 3 cm. long, was made backwards from the lower border of the cutaneous incision). The neighboring portion of the occipital bone was also involved. There was an abscess over this of the size of a gulden, which contained fetid pus. After the other cavities had been treated, the sinus was incised. It was completely thrombosed. The first drops of blood were found at a depth of 5 mm. The thrombus was fetid in places. The incision in the sinus was covered by strips of iodoform gauze and the wound was dressed.

Course entirely normal.

Temperature:— 11/7, 37.2°- 37.5°; 11/8 - 11/10, 36.9°- 37.4°; 11/11, 36.7°-37.5°; 11/12, 36.4°-36.7°; 11/13, 36.7°- 37.2°; 11/14-11/19, 36.4°-36.8°; 11/20, 36.3°-37.1°; 11/21- 11/28, 36.4°-36.9°.

Patient feels entirely well. Got up from bed on fifth day. Strips were shortened. Meatus dry. Gauze entirely removed Nov. 14, after softening strips with hydrogen peroxide. Never any pus. Beginning of granulation. Opening of sinus closed. Dressing changed every second day since then. Drum intact, dull; antrum filled with granlations.

November 20. Secondary suturing of retroauricular wound; drainage through lower angle of wound.

November 24. Dressings changed. Wound healed by first intention; suture removed.

November 25. Patient allowed to go home for private treatment.[1]

As stated in the beginning, the noteworthy point in the above case of pyemia lies in the contrast of the symptoms before the operation and the uneventful course with the findings at the operation, which consisted of extensive disease of the dura of the posterior and middle cranial fossa and a purulent thrombosis of the sinus. *This purulent thrombosis gave the patient scarcely any trouble. There were no rise of temperature, no chills, and no pyemic metastases in spite of the extensive lesions.* The difference between the course and the findings at the operation allowed us to refrain from laying bare the jugular.

I have found no similar case of infectious thrombus without fever in the literature. The case of Kolb[2] (A Case of Thrombosus of the Sinus of the Brain, *Berlin. klin. Wochensch.*, 1876, No. 46) in which the diagnosis was made from the edema and hyperemia of the mastoid, etc., without operation, will not stand criticism.

To explain the cause of the unusual course of this case, recourse must be had to its bacteriology. The examination, made twice in the Pathologico-Anatomic Institute (Prof. Weichselbaum) gave a similar finding for the pus in the abscess and in the thrombus: microscopic; diplococci, positive to Gram, often with a typical capsule: culturally; colonies of a diplococcus which were characterized by their distinct mucous appearance on agar, but otherwise agreed with the diplococcus pneumoniæ.

It must remain undetermined whether the diplococcus which is characterized by the mucous appearance of its colonies is to be distinguished from the pneumococcus, and whether thereby the unusually mild course of the thrombophlebitis in this case is to be explained.

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(1) Completely cured since end of Dec., 1904.
(2) Cited from Hessler, "Die Otogene Pyaemie, Jena, 1896.

XXIII.

THE SUBMUCOUS WINDOW RESECTION OF THE NASAL SEPTUM.

BY PROF. GUSTAV KILLIAN,

FREIBURG, I/BR., GERMANY.

TRANSLATED BY E. EDWIN FOSTER, M. D.,

NEW BEDFORD, MASS.

For a long time it has been my intention, and my students and the visitors to my clinic have urged me, to publish the way in which I perform the submucous window resection of the nasal septum, but unfortunately I have been hindered from so doing by more urgent work. Various ways of performing the submucous operation have of late been written, and different opinions have arisen as to the share I have taken in the development of this method, therefore I have decided not to delay this description any longer.

Most of the deformities of the nasal septum have their origin from an injury. They are located anteriorly in the region of the cartilaginous septum, and have the shape of a bow or angle, producing a narrowing or closure of the nasal cavity into which they project. Generally they are associated with an alteration in the shape of the external surface of the nose. There is no doubt that these cases were earlier chiefly the subjects of surgical intervention. The submucous method of correcting these deformities was first done, as is described in the current historical article by Suckstorff.

These operations were generally performed by the surgeon without the use of artificial light; therefore their object was only incompletely accomplished.

The rhinologic technic came to the aid of this method first through Hartmann; then through Roux (1886), and Juracz (1888) a high grade of perfection was reached. It appears to me that Krieg was the first to prepare the way for the opera-

tive treatment of extensive and deep-seated deformities of the septum. He removed the mucous membrane of the side of the septum operated upon, because it was in the way during the operation.

As the importance of correcting moderate thickening and bending of the cartilage and bone became more evident, one was content to remove these ridges and spurs by the different methods, and leave the deviation uncorrected. This was also my standpoint at the end of the nineties. The use of Krieg's method taught me at first to remove the whole of the central divergent segment of the nasal septum, and then, above all, to thoroughly resect the deep-lying part of the deviation. Those cases with marked ridges, through overgrowth, I also treated in a similar way, and the saw gradually went out of use in my clinic.

What did not please me in this operation, although the remainder was very satisfactory, was the long process of healing. Without careful treatment, occasional removal of granulations, cauterization with nitrate of silver, the use of tampons, etc., one could not expect satisfactory results.

In those cases where a mucous flap had been left, the healing took place much better than where the mucous membrane had been destroyed; and a well applied flap healed still better, with little, if any, after treatment. Thus the advantage of a complete preservation of the mucous membrance became apparent. At about this time Hartmann made known his new nasal forceps (Hartmann's Conchotome), which made possible the removal of cartilage and bone from a very narrow space. I had also learned with my "rhinoscopia media" to make the deep and narrow parts of the nasal cavity accessible and easy to survey, so I began to use my long specula and Hartmann's forceps in the resection of the septum. The mucous membrane flap could, with the use of my specula, be easily held out of the way and not interfere with the operation.

Finally I proved to my satisfaction that, with a single opening through the mucous membrane at the nasal orifice, the two mucous layers could be elevated from the cartilaginous and osseous septum and held apart with my long specula, so that, with Hartmann's forceps, under the direction of the eye, the whole deviating cartilaginous and osseous part of the septum could be resected to any depth that one desired. The cases thus operated upon healed so rapidly and satisfied me

so well that I desired to make it known to my fellow-specialists at the Münchener Naturforscher-Versammlung. As there was a scarcity of material for this meeting, I offered the operative treatment of the deviation of the septum as a subject for discussion, and as an introduction I reported in detail my method (vide Transactions of the Gesellschaft Deutscher Naturforscher und Aerzte, 71. Versammlung zu München, II. Teil, II. Hälfte, S. 392, Sitzung am 22 September, 1899). There ensued a lively discussion, in which I and Bönninghaus, especially, differed as to the pros and cons of the submucous operation. In the report of the proceedings of the meeting, however, there was only an abbreviated account of the treatment of our subject, and my review I made as short as possible, reserving all details for a more complete publication, which, unfortunately, has not appeared until now.

This could have given the impression that I was satisfied with the operation as given out five years ago, but the opposite is the case. There is hardly another operation to which I have given so much attention and care, as to the submucous window resection of the septum. I have endeavored continually to improve the technic, and again and again I have constructed and tested new instruments. My preference for this method has been constantly increasing, because the healing and results throughout have been so remarkable.

The indications for this operation became more and more numerous, and now I am convinced that this operation should be used whenever there are sufficient reasons for any operative interference.

My students and the visitors to my clinic have learned my technic. My instruments are listed in Fischer's (Freiburg i/Br) catalogue, and can be purchased in nearly any country. (F. A. Hardy & Co., Chicago, Ill., are Fischer's American agents.)

At a number of Congresses I have privately demonstrated and advocated the submucous resection, but this kind of promulgation does not appear in print. It also appears that it is not known in Vienna, notwithstanding that I have often had visitors from there.

Much has been omitted from the earlier presented work, which I, in the course of time, have tested and proved to be of less value than the present described procedures.

My experience is not from a dozen cases, but on the contrary from 220 which are recorded in the operation-book of

my clinic (1899-1904). I have done the most of these, the others having been done by my assistants.

The abnormal form of the nasal septum differs essentially in accordance with the origin. Through disturbances in growth there occurs a bending in part or the whole of the septum, but both can be combined so as to produce an irregular deformity. The strongest convexity usually corresponds to the upper edge of the vomer, but the quadrangular cartilage can be alone deformed, either below or high up; in the latter case the lamina perpendicularis of the ethmoid is generally involved in the deformity. Ridge formation rarely fails in such *in toto* deviations of the septum. The ridges always follow the upper border of the vomer, beginning well down in the region of the nasal orifice, and extend backward and obliquely upward. The ridges are sometimes more developed in their forward part, but more frequently in the deeper part; rarely is there a circumscribed thickening in the form of a spur.

Marked ridge formation is frequently associated with pronounced deviations, seldom, however, does it appear upon the concave side. Pronounced acute-angled deviations are, as a rule, of traumatic origin.

I have always observed that the ridges caused by disturbances in growth possess a cartilaginous covering, which is a continuation of the septum cartilage and extends from it backward in the region of the completely bony septum to the extreme posterior end of the ridge. There is rarely a similar covering on the concave side.

The principal part of a ridge is bone which is formed from the vomer.

It also happens that the nasal septum, especially the quadrangular cartilage, develops to an abnormal thickness. In a narrowly constructed nose such a condition deserves special consideration.

Essentially different from the alteration of the septum due to disturbances in growth, just mentioned, are those due to injury. They are always located on the forward part of the septum, that is, in the region of the cartilage. They can, however, extend more or less backward on to the bony septum. The deviation is in the form of an acute angle, because the fractured lamellae of the septum form an acute angle, pro-

ceeding from above and below. Therefore the groove runs from forward, backward.

The most anterior part of the cartilaginous septum is thereby twisted upon its vertical axis, and lies obliquely from the forward part towards the groove; its free edge projects into the free nasal orifice; its forward surface can be seen on the other side and can assist in completely closing it. On the wide side, a deep hollow like the inside of a boat is seen. The tip of the nose is deviated toward the wider side. The ridge of the nose shows a concavity above its tip. Where the fractured lamellae of the septum are pushed together, the mucous membrane is thinned and the cartilage thickened. The thickening can have grown very thick and appear as though one of the fractured pieces had been shoved over the other. I have also found, in cases operated on, multiple fractures, with the fractured pieces shoved irregularly over one another. Here and there, between the mucous membrane layers, the cartilage is completely absent.

It should be mentioned that the quadrangular cartilage is sometimes luxated from the border of the vomer and located to one side; this can also be combined with a fracture.

Further, traumatic deformities can occur in combination with those dependent upon disturbance in growth.

There is still another kind, or modification, of septum deformity, of the most varied origin, which must sometimes be subjected to the submucous resection, and which I will designate as rhinologic. It is the after-result of the frequent method of treating with electrolysis, galvanocautery, knives, chisels, and saws of numberless varieties. After the use of any of these methods there still remains, as a rule, a considerable deformity, or there is a hole as the result of the above endeavors.

In such failures the surgeon often has a very difficult task before him because the cartilage of the septum is here and there absent, the mucous membrane is very much thinned, the perichondria of the two sides have grown together, and under certain circumstances there will be synechia between the septum and the opposite lower turbinate.

The existence of changes as described above are, in many cases, not sufficient ground for an operative procedure. It is then advisable to operate only when the alteration is of a high degree or for cosmetic consideration. We

undertake a correction for disturbances caused through alteration of the septum, provided they are of such a degree as to
warrant surgical interference.

The principal disturbances to be considered are of a respiratory character, and I need not go any further into this great
chapter of rhinology than to mention, that we are often confronted with the question whether we shall partially or completely remove the inferior turbinate, together with its bone,
or perform a septum operation. The first is for both the surgeon and patient by far the quicker and easier. One must,
however, bear in mind that an extensive physiologic mucous
membrane surface is permanently destroyed, and there is allowed to exist an unequal width between the two sides of the
nose. I will not enter farther into the subject than to say
that, regarding the total resection of the inferior turbinate, so
much can be done, that evil results will last for the remainder of life. I believe it is more correct to cut away with
the scissors only the swollen and hypertrophied mucous membrane of the inferior turbinate, and then to operate on the
septum and bring it to its normal median position. The mucous membrane of the inferior turbinate will so far regenerate
that it can fulfill its respiratory function nearly as well as
normally. Thus, if one will treat in accordance with my suggestions, the respiratory mucous membrance of the nose will
remain as near normal as though not interfered with, and the
therapeutic result must be corresponding.

Besides the disturbance to respiration, there can also be
other conditions making an operative correction of the septum
deformity advisable. I refer to the growth of polypi, and to
chronic affections of the nasal sinuses. It is well known that
such conditions are especially persistent in a narrow nose, and
that the making of a diagnosis and the carrying out of the
treatment is very difficult. It may be impossible to help the
patient until the deformed septum has been corrected. I have
also made use of the operation under consideration for chronic
bronchial catarrh, and for reflex neuroses of different kinds.

In ozena, with a narrow nasal cavity on one side, it is well
to try to make the narrow side wider and thus the wide side
narrower.

With the indications for this operation, I will contrast the
contraindications.

The submucous resection of the septum can be both tem

porarily and permanently contraindicated. The latter applies to people of advanced age, unless there be important reasons for interference. Such patients have lived their whole life with faulty nasal breathing, and surgical interference in the nose is not in general borne as well as in younger individuals.

Small children are also not good subjects for such an operation, as their nasal proportions are small and the narcosis is not so satisfactory. Besides we have had no experience with such, as the disturbances from growth occur later. From twelve years on, the submucous resection of the septum can generally be performed.

This operation is also contraindicated on patients suffering with different chronic constitutional diseases. In pulmonary tuberculosis, one should operate only during the early stages, and then only on those who are well nourished, and who have a well-grounded prospect of a standstill or healing of their disease. The restoration of a free nasal breathing is often of the greatest value to such. If there already exists good nasal breathing in patients with diseased lungs, they should be sent to a sanitorium for the "air cure."

I never operate on cases with temporarily healed nasal lupus, because of the danger of a recurrence and the extension of the lupus process.

The operation is temporarily contraindicated on all patients with an acute process in the region of the nose. I would especially caution against operating on a patient who is suffering with an acute rhinitis, for besides the local bad effect there is a possibility of more distant trouble, as an inflammation of the throat and middle ear.

In cases with chronic catarrh of the nose and sinuses, where the secretion is essentially mucous, the operation can be undertaken without fear.

If there exists a decided purulent secretion, it is best to put off the operation until there is a marked improvement, unless urgent reasons for operating are present.

I always do any necessary operation on the turbinates after the septum resection, instead of before, as the wound of the turbinate will remain purulent for a long time.

Fresh injuries of the septum should first be allowed to heal. One can wait a year if necessary.

Patients suffering with tertiary syphilitic lesions in the nose,

must not be operated on until healing has taken place, and a long time has elapsed without recurrence.

TECHNIC OF THE OPERATION.

Because of my extensive experience I am in a position to give a complete description of the undertaking of the submucous window resection of the nasal septum. Each one of my statements has been carefully considered and proven to be of practical value. The procedure will not in the hands of everybody be perfectly successful from the beginning. One must possess ample skill in the ordinary rhinological work, and should especially make himself thoroughly familiar with the different steps of this operation.

On account of the necessity of a perfectly aseptic technic, the operation is somewhat complicated. Much time can be saved by having assistants who can make the necessary preparations, and who thoroughly understand the operation.

PREPARATION.

The submucous resection of the nasal septum requires thorough asepsis, and those who do not adhere closely to it, will occasionally experience infection. The patient will have pain soon after the operation, the nose will swell, and there will be a rise of temperature. Between the two mucous membrane layers of the septum, a sero-sanguinous fluid or pus will accumulate. Relief from the above mentioned symptoms can easily be obtained by letting out the exudate through the operation incision, but healing, on account of the infection, is retarded from 8 to 14 days, and what we have said in praise of the great advantage of the submucous resection method, the rapid healing, will, through such failures in the asepsis, appear fallacious.

We strictly follow the rules of asepsis as laid down by the general surgeon. The operation should, if possible, be performed in a room that is easily cleaned, like a surgical operating room. All that is to come in contact with the patient and operator must be sterile. It is best not to treat purulent and infectious conditions in the same place where aseptic operations are to be performed.
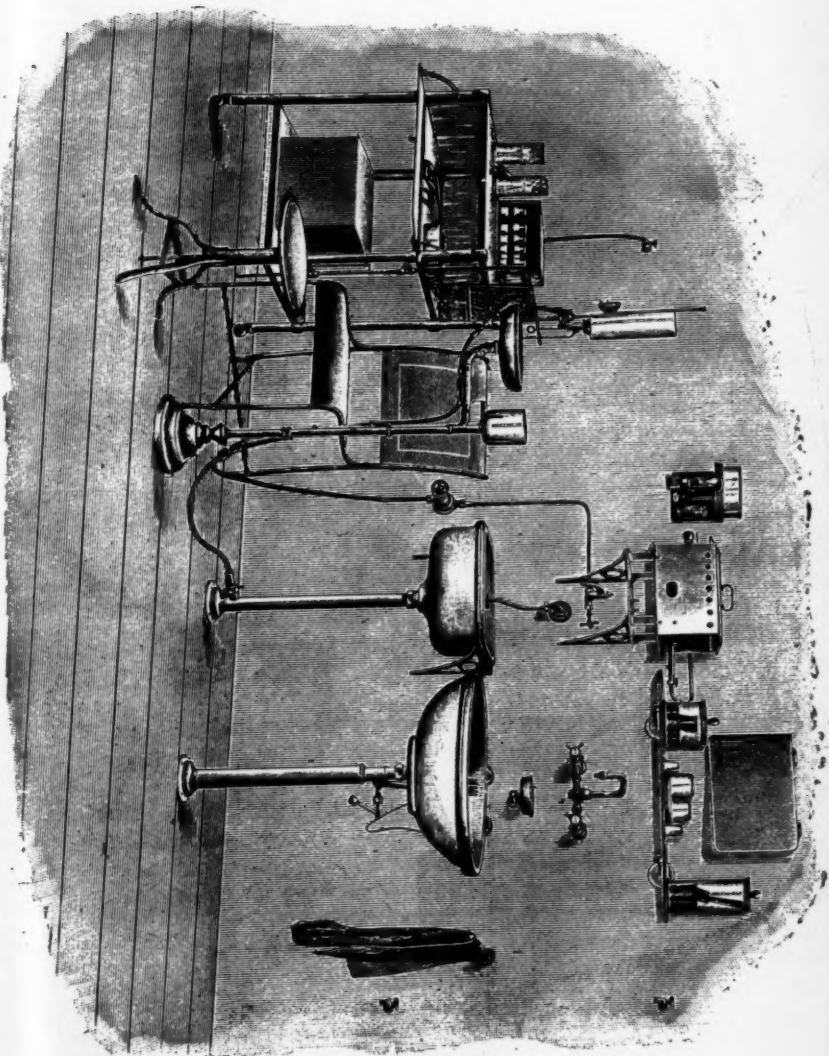
Fig. 1. Aseptic operating room in the laryngo-rhinologic clinic in the University of Freiburg i Br.

CLEANING THE FIELD OF OPERATION.

Have the patient wash his face and the nasal orifices with soap and water. Then the nasal vestibules, the outside of the nose and surrounding parts should be washed off, by the surgeon or his assistant, with a weak solution of sublimate.

The inside of the nose usually requires no special disinfection, because as a rule, there exists no virulent bacteria therein. This, of course, applies only to the nares in which there is no acute or chronic inflammation. In case there be indications for a submucous resection in a nose so inflamed, one can try to wash away the virulent bacteria by syringing the nose with a weak antiseptic solution.

The patient should be covered with a sterile cloth, large enough to protect his hands, and should be cautioned not to touch the cleaned area. The head is covered with a sterile cloth or rubber cap, so that the operator's hands will not become infected during the operation by placing them on the hair of the patient's head.

The operator, the assistant and the nurse, who holds the head of the patient, must thoroughly clean their hands before the operation.

It is advisable not to treat infected patients before the operation, thus avoiding contaminating the hands with infectious material.

We clean our hands after the procedure of C. Haegler, which he has so logically founded and described in his well-known and excellent book "Haendereinigung, Haendedesinfektion und Haendeschutz." The hands are covered with bolus alba and enough water to form a paste. The paste is well rubbed into the skin, this removes the fatty substance. The hands are now washed with soft-soap, water and brush. Haegler lays the greatest value upon the rubbing of the hands with a rough sterile towel. After a thorough rubbing the hands are rinsed with 96 per cent alcohol, and finally with sublimate 1:10,000.

INSTRUMENTS.

All necessary instruments are sterilized by boiling in a 2 per cent solution of bicarbonate of soda immediately before the operation. It is best to have a separate set of instruments for the submucous resection of the septum, and under no cir-

cumstances should they be used in the treatment of purulent processes.

After the instruments have been sterilized, they are laid out upon a sterile glass plate or towel. The vessels to be used during the operation should also be made sterile. The bottles, which hold the necessary drugs, should be cleaned with an antiseptic solution. Of late we use sterilized metal clamps, which fit around the bottle in such a way that the operator's hands need not come in contact with the bottle (Fig. 2).

Fig. 2. Holder for the cocain bottle.

We use, of course, sterilized sponges and cotton. The latter is in the form of a roll, kept in a specially constructed case, and sterilized while in the case by placing the case in a steam sterilizer.

The powder blower, before using, is covered with sterile gauze. The head-mirror must be disinfected. I am using head-mirrors, the mirrors of which are cemented into metal holders. The head-band is of hard rubber.

Excellent local anesthesia can be produced by submucous injections of a ½ per cent solution of cocain with the addition of a little adrenalin, (Braun).

ANESTHESIA.

We use 2 c.c of a ½ per cent cocain solution, and to it we add 4 drops of a solution of suprarenium hydrochloricum in physiologic salt solution 1:1000. (Farbwerke, Höchst a/M.)

The place to be injected is first anesthetized by applying to it a little of a 20 per cent cocain solution. This place is on the anterior lower part of the septum, near the boundary between the vestibule and the principal cavity of the nose (Limen).

The injections are to be made on both sides of the septum, principally in the region of the forward end of the vomer and
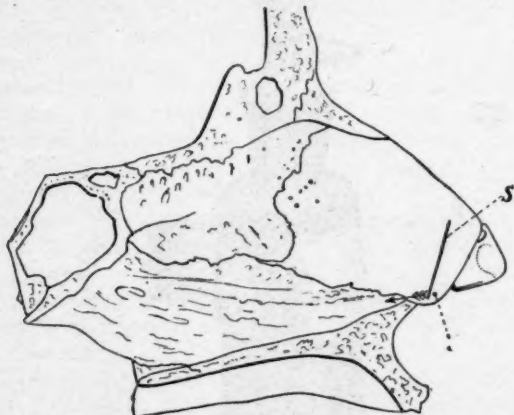
Fig. 3. Nasal Septum.—J. Location of the subperichondrial injection of cocain-adrenalin. S. Incision in the mucous membrane for the submucous window-resection.

the place for the incision. We use for this purpose a sterilized Pravaz's syringe, with a very sharp needle about twice as long as an ordinary needle. The syringe is filled and the needle firmly screwed on, with the oblique surface of the needle facing the septum. The needle is pushed through the mucous membrane to the cartilage, so that the fluid forced out of the syringe will separate the perichondrium from the chondrium. If one succeeds in doing this, the mucous membrane over the point of injection will become pale and bulge out. As more fluid is injected it will, in the majority of cases, spread out and continue to elevate the perichondrium. The

bulging will grow larger at its circumference, but principally in a backward direction. In such a way a large part of the septum can be anesthetized.

In addition to the anesthesia, the tendency to bleeding is in this way greatly decreased. The mopping up of blood is thus less frequently necessary, and the operation can be completed more easily and quickly.

It may be well to state that we inject one cubic centimeter of the above mentioned mixture into each side of the septum. The injection is not easy and must be practiced.

The use of the ordinary nasal specula makes it difficult to examine the relative parts of the septum, and interferes with the placing of the needle of the syringe. I, therefore, as a rule, pull the ala nasi outward with a simple retractor (Fig. 4)

Fig. 4. Hook for lifting the alae nasi.

which can be attended to by the nurse who holds the patient's head.

It is best to make the injections slowly. As a general thing, directly after the injections there occurs palpitation of the heart, which usually disturbs anxious and nervous persons, but which quickly passes away. If it seems desirable a swallow of brandy may be given.

Fifteen minutes must intervene from the time of making the injections until the beginning of the operation, so that the injected fluid will have sufficient time to work. It is best, directly before the beginning of the operation, to carefully paint the whole of the mucous membrane of both sides of the septum, especially in the upper posterior region, with a 20 per cent cocain solution. Thus can one feel sure that the patient will not experience any pain during the whole of the operation.

OPERATION.

The patient sits erect on a chair; a nurse stands behind and holds the head of the patient facing the operator, who is seated on a stool so adjusted that he can easily see in a horizontal direction into the nose to be operated upon. At the operator's right is the instrument table, with all the necessary instruments conveniently arranged; at his left is another table, with a sterile cover, so that he can easily lay down instruments and things on either side.

Close by is a stool with a vessel containing a weak solution of sublimate, in which the hands and instruments can occasionally be rinsed, also a sterile towel should be convenient.

The assistant sits on a stool behind the operator, in such a position that he can follow the progress of the operation by looking past the operator's right ear. I would like to remark here, that one can, on account of the small amount of bleeding (as a result of the injection of adrenalin-cocain) dispense with an assistant, but it is very convenient and shortens the duration of the operation, if there is somebody at hand who can at the right moment mop up what little blood there is.

Only for a short time, when the chisel is being used, is it hard to dispense with the help of an assistant.

(a)—INCISION OF THE MUCOUS MEMBRANE.

On which side shall we make this incision?

It can be made either on the concave or convex side. I choose as a rule the convex, because here the mucous membrane is thinner and easier to injure than upon the concave side. Working from the concave side, it is much more difficult, and indeed sometimes impossible, to elevate the opposite mucous layer without perforation.

We nearly always operate on the convex side, i. e., sometimes right and sometimes left, therefore, one must practice using the knife and elevator with the left hand, until it is as skilled as the right.

I make the cut through the mucous membrane of the septum with an ordinary small-bellied blade scalpel. In making the incision I have the ala nasi pulled out and a little up with a retractor, and place the little finger of the hand not holding the knife, in the other nasal orifice so far that I can feel the knife as it cuts into the septum. In so doing, one avoids the complete cutting through the latter. Great care must be used

in regulating the pressure on the knife with the sharpness
of its blade. The incision should always be made from below
upward, i e., from the floor of the nose toward the tip. If
made in the opposite direction the blood will flow over the
field of operation and obstruct the view. The line of incision
runs from behind and below, upwards and forwards.

The operation is easier if the incision is made well forward,
but I consider it of · great value to leave a part of the
forward end of the cartilaginous septum to act as a
support to the outer nose.   My incision is made, for that
reason, about half a centimeter back of the movable edge of
the septum, not parallel to it, but a little oblique. The upper
end is one centimeter or more further back than the edge
of the cartilage. (Fig. 3 S.)

Only when the forward part of the cartilaginous septum
deviates from the middle line, or is pushed over to one side,
do I begin the resection from the edge of the cartilage, as
Hajek does in all cases. This is best done by pushing the
movable noncartilaginous part of the septum to the side op-
posite the deviating cartilage edge, and then cutting upon the
aforesaid edge.

It will be easily seen that the first part of the operation
under such circumstances is more easily accomplished, for
the perforation of the cartilage with injury to the mucous
membrane of the opposite side, which beginners frequently ex-
perience, is lacking.

The first cut should pass completely through the mucous
membrane and a little way into the cartilage. If this is not
done, then other cuts should be made until the incision does
extend completely through the mucous membrane. The peri-
chondrium of this side must not, under any circumstances, re-
main intact, and when the edges of the incision are separated,
the bare cartilage should come into view, for only between the
perichondrium and chondrium can the mucous membrane be
easily separated from the latter.

In order to be sure that the cartilage is absolutely free, I
always scrape over the surface with a sharp elevator. The
elevation of the mucous membrane of the incised side can now
be undertaken. I begin this elevation by first carefully dis-
secting the mucous membrane from the cartilage for a dis-
tance· of about ½ centimeter with the sharp elevator (Fig.
5a and 6), then in this narrow undermined place I put

the blunt elevator (Fig. 6), with which the mucous membrane can quite easily be elevated backward, upward and downward, from the cartilage and bone. The best way to avoid an injury to the mucous membrane is to look into the side of the nose being operated upon, and control the progress of the elevator by watching its movements, which can be seen through the mucous membrane. The elevation should extend as far

Fig. 5.   Fig. 6.

a   b
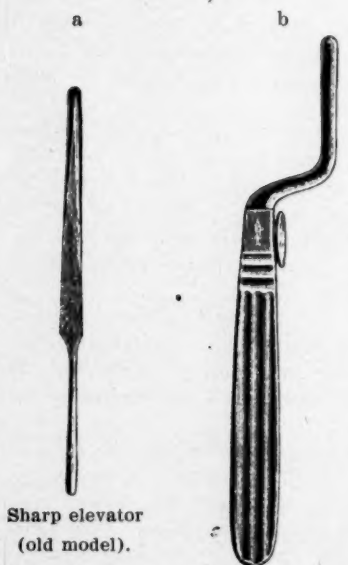
Sharp elevator
(old model).

Sharp elevator
(new model).

Blunt elevator.

as possible backward and upward (Fig. 7. A). It is difficult to pass downward over the crest of a ridge before the cartilage has been resected, as the mucous membrane is thinnest at this place and easily torn; but if the ridge becomes flatter as it extends backward which is usual the case, it is, with care, quite often easy at this place to pass downward over the crest without injury to the over-lying membrane.

The deviations and ridges on the forward part of the septum are as a rule, so markedly bent and coming so near the floor of the nose, that it is nearly impossible to elevate the membrane from around and under them until the cartilage and bone has been resected.

It is especially difficult to elevate the mucous membrane from the sharp angle of a traumatic deviation of the quadrangular cartilage, and he who tries to do so will perforate it as a rule.
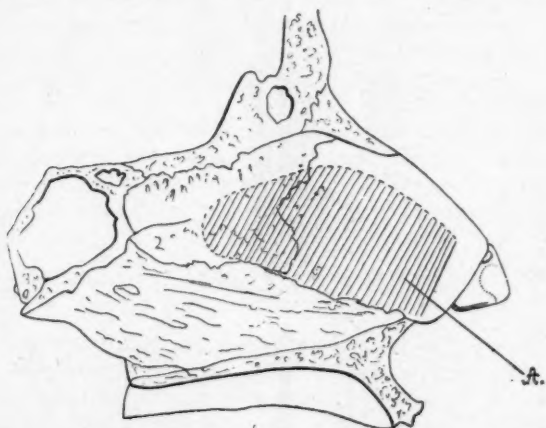

Fig. 7. Nasal Septum.—A. Area of detachment of mucous membrane from septum (shaded).

Thus, one should advance only to the edge of the ridge and not attempt to elevate the remaining mucous membrane until the cartilage has been resected to this place. When such a resection has been completed, the remaining deviating part can always be pressed to the opposite side, and the freeing of the mucous membrane is quite easily accomplished.

Another difficulty is when the traumatic deviation is so great that the convex side of the nose is markedly narrowed or completely closed, but with patience and skill this can be easily overcome. The difficulties of this operation, as have been described, are met with on the forward part of the septum, indeed in many cases confined largely to the cartilage. The reason for this is that the deviations as a rule gradually diminish toward the deeper located part.

(*b*)—THE INCISION OF THE CARTILAGE.

In order to elevate the mucous membrane from the concave side, one must cut through the cartilage in the vicinity of the mucous incision, but in doing so great care must be used to
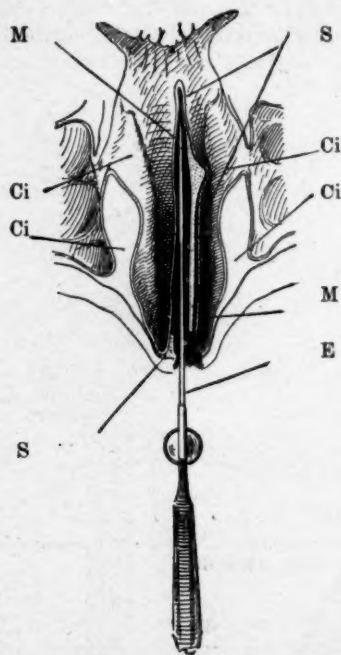

Fig. 8. Horizontal section through nose, 1.5 cm. above floor of nose.

Schematic representation of the detachment of the mucous membrane, the instrument entering the incision and passing through the quadrangular cartilage to the other side of the septum.

Ci, lower turbinal; S, bone and cartilage of septum; M, mucous membrane; E, blunt elevator.

avoid injuring the mucous membrane of the opposite side. I advise, in this manœuvre, to again place the little finger of the free hand in the opposite nostril, then with the sharp ele-

vator, under careful control of the afore-mentioned finger, the perforation of the cartilage can be accomplished. One begins at the upper part of the mucous membrane incision, places the sharp elevator against the cartilage, scratches with it in a line with the said incision, and slowly seeks to pass through. The instrument is not placed at a right angle with the surface of the cartilage, but on the contrary at an oblique angle, and the farther one goes through the cartilage the more it is pressed toward the concave side. Always have in mind, however, the approach to the delicate mucous membrane of the opposite side. When a small opening has been made through the cartilage, the sharp elevator will easily pass downward through the underlying cartilage, in a direction parallel with the mucous incision. The perforation of the opposite mucous membrane is thus easily avoided. This procedure is made much simpler if the first incision through the mucous membrane has been carried into, or nearly through, the cartilage.

(c)—THE ELEVATION OF THE MUCOUS MEMBRANE OF THE OPPOSITE SIDE.

As soon as the cartilage is perforated and the opposite mucous membrane has been elevated a little with the sharp elevator, the blunt elevator is brought into use. It is used in about the same way as before described, except being pushed in between the cartilage and the mucous membrane of the opposite side. It should always be kept tightly held against the cartilage, and its movements watched through the mucous membrane, which can easily be seen by looking into the nasal cavity of this side with the aid of a speculum.

In such a way the mucous membrane can easily be elevated as far as the septum is deformed, and indeed as well in the region of the quadrangular cartilage as in the region of the vomer, with the exception of its extreme anterior end. The mucous membrane can also be lifted out of deep concavities, if one will work backward always under the perichondrium.

Only in deep grooves is there much difficulty experienced. Here it is advisable not to attempt to elevate the mucous membrane until a large piece of the cartilage has been resected.

When we have loosened the mucous membrane to a large extent from both sides of the septum, we can begin the actual resection.

RESECTION.

(a)—CARTILAGE.

The actual resection is done by separating the two elevated mucous layers with the use of my nasal specula: one blade passes through the cartilaginous incision, while the other is placed beneath the membrane first elevated. This leaves the septum between the two blades and the two mucous layers on the outside. I use from the smallest to the largest of the specula that I devised for the examination of the middle and back part of the nasal cavity (*rhinoscopia media*). (Fig. 9.) In using these specula one makes a central cavity in which one can easily work. (Fig. 10.)

Generally I have removed the cartilage with Hartmann's forceps and the corn-forceps. I nip away from the septum, with Hartmann's forceps, a groove above and one below, and then twist away the interlying cartilage with the corn-forceps. Of late I have been using a cartilage knife that I constructed for this special purpose.

It has the shape of a fork. (Fig. 11.) The separation of the two prongs corresponds to the thickness of the cartilaginous septum, so that the cartilage can pass between them. Near the end of the instrument there is a knife transversely fixed between the prongs. In using this instrument the knife is placed against the forward edge of the cartilage, with the two slightly projecting prongs at either side, and pressed backward. It cuts through smoothly without slipping to right or left, and has in my hands accomplished its purpose excellently.

The first cut to be made with this knife is through the upper part of the cartilage to be resected, then through the lower part, in a linear direction from before backward, and the intervening piece is removed with the corn-forceps. The remaining cartilaginous defect is removed as far as necessary with Hartmann's forceps. (Fig. 13.) Then as a rule I remove the thin forward part of the lamina perpendicularis. (Fig. 12-1.)

One can first remove the bottom part of the cartilaginous septum. (Fig. 12-2.) This is firmly united to the vomer and covers a posssible existing cartilage ridge

With my sharp elevator I now free the cartilage of its covering, from the entrance of the nose to the forward end of the vomer, and separate it from the latter, which is easy to do,

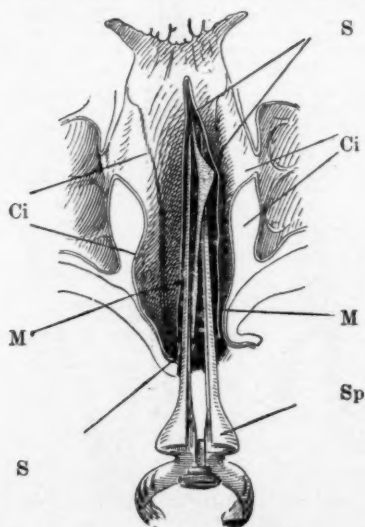Fig. 9.   Author's nasal specula, one-half natural size.

Fig. 10.   Horizontal section through nose, 1.5 cm. above floor.
Schematic representation showing how the mucous membrane of
both sides is held away from septum.   Ci, inferior turbinal; S, sep-
tum; M, mucous membrane; Sp, my long sepculum, grasping the
septum.   The left blade passes through the incision in the quad-
rangular cartilage on the right side of septum.

and one can simultaneously free the border of the vomer quite far back from its cartilaginous covering. The strip of cartilage thus loosened is removed with forceps.

Fig. 11. My new septal-cartilage knife, cutting from before backwards.

(*b*)—BONE.

I have already spoken of the resection of the posterior superior deviating part of the septum, which sometimes forms a ridge.
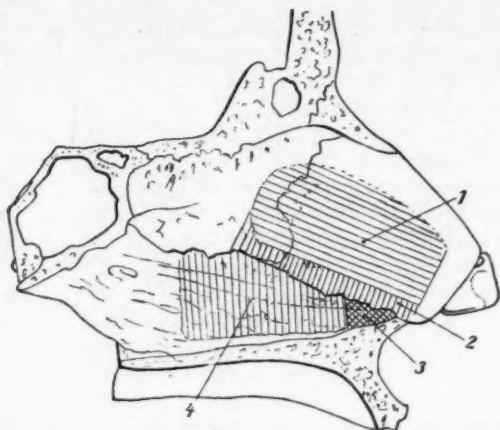
Fig. 12. Nasal Septum.—Schematic representation showing in what order the different parts of the septum are cut. (1) First area: part of the cartilago quad. and lamina perpendic. (2) Second area: lower part of cartilago quad. and lamina perpendic, where they border on the vomer. (3) Third area: anterior inferior end of vomer (anterior area vomer triangle). (4) Fourth area: vomer (amount to be removed).
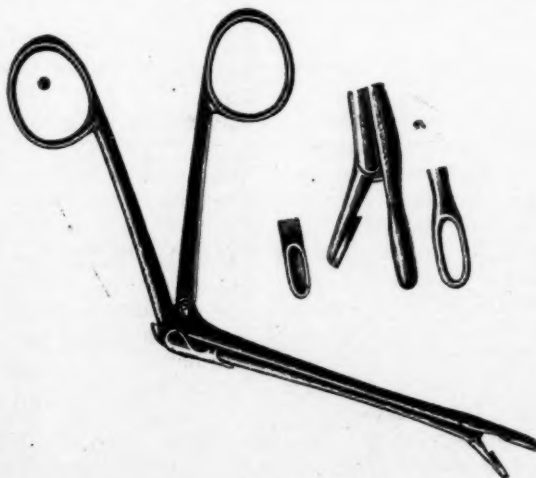

Fig. 13. Hartmann's nasal forceps.

Before one goes any further he must be sure that the mucous membrane of both sides is far enough elevated backward and upward. As a rule, there is a little to be elevated which can be done with the blunt elevator.

At this point of the resection the use of my largest speculum for rhinoscopia media is of the greatest value. The two membrane layers can easily be held apart and thus protected from injury. (Fig. 10.) The resection is done with Hartmann's forceps, except the forward end of the vomer (Fig. 12-3), which requires a special technic.

Formerly I spent much time trying to remove this generally rather thick bone with the bone forceps. Ridges having their direction along the border of the vomer begin here, that is, the anterior point of the vomer, and are often located far down near the floor of the nose.

The bone is usually so thick that it limits the field of operation, and makes it difficult to get at this bone with strong
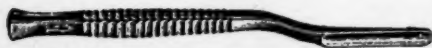
Fig. 14. My septal chisel, for removal of anterior vomer triangle (area 3 in Fig. 11).

enough forceps. I, therefore, use the chisel in the following way:—

One must know that the forward end of the vomer has a special periosteal covering.

After the removal of the cartilage, which rests upon this periosteal covering, the periosteum must be severed and separated from the bone. If it is very thick, I cut it with a scalpel, and carefully separate it from the bone with a sharp elevator. (Fig. 5 a.)

The periosteum is separated from the upper surface of the vomer downward to its most forward end, and then freed laterally, right and left. Great care must be used not to perforate the mucous membrane of the concave side.

Generally one cannot go very far back on the side of the operation, because the space between the ridge and the nasal floor is so narrow. One must be contented therefore with a partial separation, as it is enough to have the forward triangle of the vomer laid free. (Fig. 12-3.)

Now we come to the use of the chisel. I have constructed a bayonet-like instrument that I have used for a long time with the best of results. (Fig. 14.) The bayonet-like bend is made in such a way that the chisel itself is about three centimeters higher than the handle. Thus one can easily see over the fingers holding the instrument by its handle. The cutting part of the chisel is now placed on the lowest forward end of the vomer, on a level with the nasal floor. (Fig. 15.) In order to hold the nasal speculum with one hand and to control the chisel with
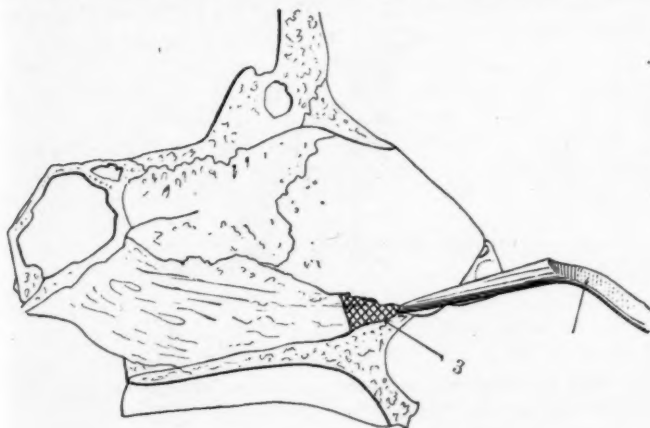

Fig. 15. Schematic representation of chiselling of anterior vomer triangle (3). M. Chisel.

the other, so as to avoid injury of any of the neighboring tissues, the assistant must use the hammer. The assistant should receive continual instructions from the operator as to the way he shall strike. The strokes must all be given with an elastic swing. Heavy, careless blows do not accomplish much, and they jar the patient's head in an unnecessary way.

Formerly, this part of the operation was made difficult through severe hemorrhage. Even a small artery in the bone can spurt so vigorously that compresses must be applied for a long time in order to stop the hemorrhage sufficiently to continue with the operation.

After the appropriate use of adrenalin-cocain injections,

with which I seek to directly hit this place, I experience very little trouble from hemorrhage.

When the base of the forward wedge-shaped part of the vomer has been chiseled through, it is detached with the chisel, then the most difficult part of the operation is over.

It is now only a question of separating the mucous membrane, right and left, from the vomer down to the nasal floor by the use of the blunt elevator.

On the side with the ridge or knee-like traumatic deviation, one tries to pass under it with a blunt elevator, which is, as a rule, possible, because the ridges all slant from the lower for-
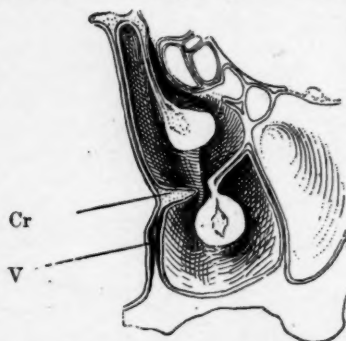

Fig. 16. Frontal section through an accessory sinus. A ridge, Cr, on septum; V, vomer; very thin under the ridge.

ward part backward in an upward direction, along the ascending edge of the vomer.

Traumatic deviations also often have a similar position. When the forward part of the vomer has been removed with the chisel, there will then always be a space between the ridge and the floor of the nose. (Fig. 16.) The vomer below a deviation or ridge, is always very thin. (Fig. 16-V.)

When one has elevated the mucous membrane from both sides of the lower part of the septum (Fig. 12-4), and has also freed the ridge as far as possible from its mucous covering, it is then advisable to cut away, with Hartmann's forceps, the thin vomer beneath the ridge.

The ridge is now above and below without connection with the adjoining septum, and it can, therefore, be quite easily extracted with a strong bone forceps. (Fig. 12-4.) The

remaining part of the ridge and deviation can be removed with Hartmann's forceps. The space between the two mucous layers should now be cleaned of blood, pieces of septum, etc., and the two layers placed one against the other, then both sides should be examined to see if the septum is now completely in a straight line. Usually a little has to be removed from the upper rim of the resected window. Every point of the septum projecting beyond the median line must be removed, so that after healing has taken place the mucous membrane will stretch in an even surface from the edges of the window resected from the septum. If the edges of this window do not occupy the median line, of course the future septum will not occupy the median line.

I always advise not to take away too much in the direction of the ridge of the nose, so that the ridge will not later sink in and produce an external deformity. When I am operating in this region I press from time to time upon the ridge of the nose, to make sure that it still possesses enough power of resistance and elasticity.

CLEANING AND CARE OF THE WOUND.

After the completion of the operation, the longest of my nasal specula is placed between the two lamellae of the septum and again the blood is carefully wiped out; any pieces of bone or cartilage that may be present are removed, and a little vioform is blown in. The speculum is removed and the mucous layers are smoothly laid one against the other, while looking first into one nares, then the other. The mucous membrane that was incised is seized with a forceps at its edge and put in its proper place, especially when it has been stretched a little or injured. The edges of the mucous incision should be brought close to one another, so that suturing will be unnecessary.

If a suture appears necessary it can be done in the following way:— When the wound is located well forward, it can be sutured in the usual way with a short, thin needle. If this is not the case, one needs a needle bent like a retractor, which I have had made for this purpose. (Fig. 17.) The eye of this needle is just behind its point. After the needle has been threaded, it is placed in the nose, first passed through the

posterior edge then the anterior edge of the mucous membrane incision. To accomplish this the mucous membrane must be held with a pair of forceps. After the needle has been passed through both edges of the incision, it must not be withdrawn until the suture is seized with a small hook (Fig. 18) at the point of the needle, and held fast. The needle is then pushed backward and removed from the nose, thus leaving the suture looped

Fig. 17. Needle for suturing mucous membrane.

Fig. 18. Hook to draw the silk threads from the eye of the needle.

about the hook. The short end of the suture can now be pulled forward and out with the removal of the hook. The knot cannot be completely tied with the fingers, but must be aided with the use of a pair of forceps, which makes it possible to tie a knot deeply located within the nose.

At present I do not, as a rule, make use of the sutures, and advise their use only when there has occurred perforations of the mucous membranes, located directly opposite one another. These perforations usually occur only in a case operated by an

assistant or others who have not had sufficient training and experience.

The sutures are always indicated when a perforation, due to other operative endeavors should be closed.

PACKING THE NOSE.

I consider it absolutely necessary to keep the two layers of mucous membrane in place after they have been exactly opposed, by the use of tampons. It is not necessary, however, to make the packing especially firm.

At first a tampon is pushed into the side not operated upon, then another. I then place my longest speculum in the other side, and with it I hold the mucous membrane in place, while I am putting in the tampons. Usually two or three are necessary.

By pressing upward or downward, also lightly pulling on the tampons, the position of the mucous membrane can be made perfect.

The outside of the nose is compressed a little and put in its correct position. Any protruding packing is cut off. The patient is cleaned and put in bed.

THE COURSE AND AFTER-TREATMENT.

I allow the packing to remain for two days, then remove it very carefully, especially from the side operated upon, so as not to tear apart the wound. This can be best accomplished by carefully loosening the cotton from the mucous membrane, and pull it out over a speculum. If the incision gapes a little, on the following day it will be seen covered with a crust. If this be troublesome, I allow the patient to stop up that side of the nose with cotton and return occasionally to have crust removed and the area painted with nitrate of silver. Usually after removing the packing there is no necessity for further treatment.

After the operation the patient is bothered only with the packing in the nose, no pain should appear. The temperature in uncomplicated cases may rise to 37.5° C. (99.5° F.) or more.

On removal of the packing one has the pleasure of seeing before him a straight septum covered with normal mucous

membrane. The small incision is scarcely perceptible. One can hardly believe that from so extensive an interference, in only two days there is almost nothing to be seen.

If the septum be not exactly in the middle, which can occur through unequal packing of the nasal cavities, it can be put in the right position by placing in the narrower nasal cavity a tampon to remain for a day or two. Even later, such a failure can be corrected in the same manner.

The patient can be discharged after a day or two, but should have his attention called to the importance of care of the external nose, so that the union will not be destroyed by carelessness.

As the external nose is very elastic it can withstand a moderate trauma without damage.

In cases which I have examined after some time had elapsed, I find that the septum has acquired quite an amount of resistance. It thus appears to be correct, what other writers have already maintained, that reformation of bone and cartilage takes place from the perichondrium and periosteum.

The equal width of both nasal cavities brings about a great relief to the patient's breathing, which formerly had to be done principally through one side. The less the resistance wthin the nose, so much less is inspiratory force required to draw the air through the nose.

In cases with unequally wide nasal cavities, breathing will take place only through the wider side, unless inspiration is forced. With equally wide nasal orifices and with equal resistance within the two nasal cavities, the complete respiratory act will be performed with the least effort.

One sees in patients with deviation of the septum, particularly if they have a long, narrow and often thin nose, the alae nasi quite close to the septum and easily drawn still closer. This condition needs to be corrected. If the septum be in a normal position and other interferences to breathing have been removed, especially thickening of the mucous membrane of the turbinates, I then recommend to the patient the strengthening of his alae nasi through exercise of the muscular structure. More is accomplished by this method than by any kind of mechanical assistance. The muscles of this part of the nose must be actively exercised each day. The patient can begin by standing before a mirror and watch the movements of the

alae.   Gradually the muscles become so strong that the alae nasi will occupy a normal position.

RECAPITULATION.

The essential feature in the technic of my window resection of the nasal septum is that I make, by means of my long specula, a median space between the two mucous membrane layers of the septum, in which I can as easily operate as in the inside of either nasal cavity.   The entrance to this space is the incision, which becomes rectangular in shape through the use of the speculum.

All the other parts of the operation group themselves about this fundamental idea.

The experienced operator can very rapidly elevate the mucous membrane from the cartilage and bone, also at the time of actual resection can remove large pieces.   The length of the incision determines this, however.   I can perform the whole operation on an average of twenty minutes.

On account of the great increase in indications for the septum operation, which we have learned in my clinic during the past few years, this operation has with us become a frequent and established undertaking.

Our rhinologic knowledge has gained a great deal through this operation, especially in ability to perform and in exactness.   Half of our unnecessary rules have disappeared and we attain in the most elegant way and in the shortest time, what was earlier, after a long endeavor, often only unsatisfactorily accomplished.   I have never had more enjoyment from any other small rhinologi   operation than from the described septum operation and can most enthusiastically recommend it.

XXIV.

THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM. A NEW TECHNIC WITH THE AUTHOR'S SWIVEL KNIFE, REDUCING THE AVERAGE TIME OF THE OPERATION SEVERAL MINUTES.

WILLIAM LINCOLN BALLENGER, M. D.,

CHICAGO, ILL.

The object of this paper is to describe, as concisely as possible, the technic of the submucous correction of septal malformations, as performed by me. The use of my swivel knife enables me to perform the operation in from five to twenty minutes, including the removal of the bony as well as the cartilaginous deviations. With the swivel knife the cartilaginous septum may be removed in a few seconds, rarely requiring more than from five to thirty seconds, thus leaving the operator the balance of the time for the preliminary incision, the elevation of the mucoperichondrium, and the removal of the bony malformations. In one case a complete operation was performed in four minutes, including the removal of the cartilaginous deviation and a bony ridge one and one-half inch in length. In another similar case five minutes were required.

My purpose in calling attention to the time element is to correct the prevailing idea that the submucous resection of the nasal septum is necessarily a difficult and prolonged procedure. I do not say that by my method every case can be operated upon within the limits heretofore mentioned, for there are cases requiring a longer time. After a reasonable experience, it seems probable that in the great majority the operation need not require more than ten minutes. Killian claims an average of twenty minutes, while Freer by his method claims an average of forty-five minutes. It is evident, therefore, that if a method of operating can be devised that will reduce the time to an average of ten minutes or even less, it should be re-

ceived with favor by both the patient and the surgeon.   In addition to the time element, the one of shock incident to prolonged local anesthesia and a complicated technic, is an item of no small importance.   It may be said, that, all other things being equal, the shorter the operation and the anesthesia, and the simpler the instrumentation, the less the shock and the quicker the healing.

My excuse, therefore, for presenting my method of performing the submucous operation, is the conviction that it enables the operator to do it in shorter time, with less traumatism, and shock, and, that, in many instances, healing occurs by first intention.

The Preparation of the Field. The question naturally arises, should the operation be performed while the nasal mucosa is the seat of an inflammatory process?   In all acute inflammations the operation should be postponed, as to operate under such circumstances might result in infection of the wound, and lead to serious complications.   In chronic inflammations, including chronic sinuitis, the operation may be undertaken if the preliminary precaution is observed of thoroughly freeing the nasal chambers of secretions by exciting outward osmosis.   This not only frees the mucosa of dried secretions, but it also washes out the bacteria buried within the substance of the mucous membrane. The exosmosis is excited by tamponing the nasal chambers with gauze or cotton wool saturated with a 10 to 25% aqueous solution of ichthyol.   The tampons should be left in place for from 20 to 30 minutes.   The serous and mucous discharge excited by the medicated tampons loosen the encrusted secretions so that upon blowing the nose, they are ejected from it.   The osmotic flow of serum also washes the bacteria from the mucosa.   In purulent rhinitis and sinuitis the tampons should be introduced daily, for four or five days, in order to thoroughly free the mucous membrane of pathogenic bacteria.   In non-purulent cases the nasal chambers should be thoroughly cleansed by sprays or douches, followed by swabbing with cotton-wound applicators.   The face of the patient should be scrubbed and the head enwrapped with a sterile towel.

The Anesthesia. A general anesthetic may be administered although it is usually preferable to use a local one.   I have performed the operation a few times under general anesthesia, finding no great difficulty except the increased hemorrhage

incidental to general anesthesia in all nasal and throat surgery. The advantages of local anesthesia are (a) the lessened hemorrhage, and (b) the greater ease of operating with the patient in the sitting position. This is a matter of considerable importance to most rhinologists, as they are more accustomed to this posture from the daily routine in examinations and treatment. I have, however, operated under general anesthesia, with the patient in Rose's position with great satisfaction. The choice of a local anesthetic depends largely upon the location of the initial incision in the nasal mucosa. If it is made in the muco-cutaneous membrane (Hajek-Menzel and White) it is advisable to use submucous infiltration as the squamous epithelium in this region prevents the absorption of the cocain. If, however, the incision is made more posteriorly (Killian) the local application of cocain may be used with good results.

The method of applying the cocain and the strength of the solution or powder, are details requiring careful consideration. I usually apply the cocain in ten to twenty per cent. solutions by means of thin gauze-like films of cotton saturated with the solution, to the entire surface of both sides of the septum. From three to four such films are required to cover each side. The film is spread over the left index finger, the bottle containing the cocain solution being held between the index finger and the thumb of the left hand, with the mouth of the bottle applied to the film-covered finger. It is then inverted until the film is thoroughly moistened. The film is then caught near its edge with a probe-pointed applicator, and carried into the nasal chamber and spread over the entire posterior portion of the septum. This is repeated until the entire surface of both sides of the septum is covered. After twenty to thirty minutes anesthesia is usually complete. In some a second application is necessary. Freer's method of applying cocain probably induces more complete anesthesia. He applies powdered cocain with a moistened cotton-wound applicator dipped into the powder. He then massages the mucous membrane with it until complete anesthesia is induced. The amount of cotton on the probe should be so small that it may be carried to the more constricted recesses of the nasal chambers. The rubbing of the powdered cocain into the mucous membrane facilitates its absorption.

Adrenalin should be used prior to the application of co-

cain to diminish the primary hemorrhage. It may be applied
with a cotton-wound probe by rubbing it over the surface of
the operative field, or it may be applied with thin films of cot-
ton after the manner already described in the preceding para-
graph. It does not always prevent bleeding, and predisposes
to secondary hemorrhage. The dressings diminish this tend-
ency, however, to a considerable degree.

The Position of the Patient. Each operator should decide
this for himself according to his individual preference and
experience. The sitting posture will undoubtedly appeal to
most rhinologic surgeons on account of their greater famil-
iarity with it, and, it seems to me, on account of the easier
access to the parts. The patient is in a position where he can
free the nasal chambers of blood, thereby obviating, to a con-
siderable degree, the necessity for the frequent introduction
of the probe-sponges. Each introduction of a probe-sponge
or instrument subjects the mucosa to more or less traumatism.
This is especially important in view of the fact that the
mucosa is incised and liable to be torn by the frequent instru-
mentation and swabbing. For these and other reasons I pre-
fer the sitting position.

The Armamentarium. It is desirable to do the work with
the fewest instruments that will accomplish it in the best
possible manner in the shortest time. A multiplicity of in-
struments is confusing, and causes loss of time and energy.
The instruments required, will, of course, depend somewhat
upon the method of operating. In a simpler method of op-
erating, the technic is simple, and the danger of traumatism
incident to the more frequent introduction of instruments is
obviated. I do not mean to imply that there is necessarily
excessive traumatism with a complex armamentarium, as a
careful and painstaking operator will overcome this objec-
tion. I only wish to emphasize the point that a few instru-
ments well selected, and a method of operating that obviates
the need for their frequent introduction in an enclosed cavity
like the nasal chambers, reduces the liability to laceration of
the mucous membrane to the minimum.

The technic. The technic to be described in this article re-
quires five special instruments, namely, one swivel knife, two
elevators, one gouge, and one bone cutting forceps. In addi-
tion to these a nasal speculum, preferably the De Vilbiss wire

speculum, a mastoid mallet, cotton applicators for sponging, and a short-bladed scalpel should be at hand.

The technic described in this paper is a modification of that employed by Hajek-Menzel, White and Killian. The chief difference is in the removal of the cartilaginous portion of the septum. Heretofore this has been removed piecemeal with cutting forceps, or with knives and forceps in conjunction. By my method the cartilaginous septum is removed in one piece in a few seconds with the swivel knife designed by me in the early part of February of this year.

The swivel knife (Figure 1) is composed of two parts (a) the handle and the prongs, and (b) the stirrup blade which swings between the tips of the prongs. The prongs are placed astride the cartilage through the incision so that the
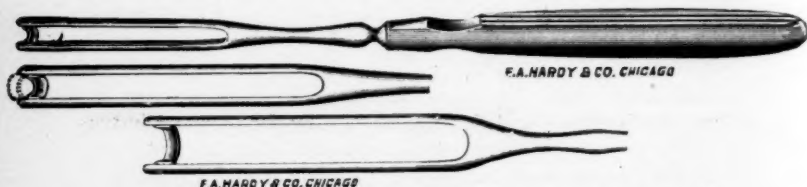

Fig. 1. The author's swivel knife is made in two parts; the handle and prongs and the swivel blade. It is only used to remove the cartilaginous portion of the septum, which it does in one piece in a few seconds. The above illustrations show the two widths of the swivel knife. The wider one is for extreme deviations of the septal cartilage.

blade cuts the cartilage as the prong-tips describe the outline of the cartilage to be removed. The swivel knife is so constructed that the resistance of the cartilage through which it is cutting keeps the cutting edge of the blade turned in the direction in which the prong-tips are moving. If the prong-tips are moving towards the posterior portion of the septum, the cutting edge is turned backward; if upward, the cutting edge is turned upward; if forward the cutting edge is turned forward; if downward the cutting edge is downward. Indeed, it is possible to cut a circular or any other shaped piece of cartilage from the nasal septum with it. With the swivel knife it is possible to remove the cartilaginous septum with one introduction of the instrument between the mucoperichondria in a few seconds, thereby reducing the time of the operation several minutes.

What has heretofore required minutes, now requires sec-

onds to do. Freer claims twenty minutes for the removal of
the cartilaginous portion, whereas by my method, it can be re-
moved in from a few seconds to one minute. More time
may be required if the case is one in which the outline of
the deflected cartilage necessitates careful study; or if there
is extreme deviation. The time required to remove the car-
tilaginous portion of the septum is so startlingly short that
· one hesitates to state how quickly it may be done with intelli-
gent accuracy. The swivel knife is under perfect control all
the time without the aid of any mechanical device in the way
of levers or set screws to control the direction of its cutting
edge. Keep the prong-tips moving so as to outline the area
of deflection and the resistance of the cartilage will keep the
cutting edge of the blade so adjusted as to encircle the cartil-
aginous deflection and remove it *en masse*. As to the rest
of the operation it differs in minor details, only, from the
Hajek-Menzel and Killian methods.

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Fig. 2. The author's mucosa knife with which the preliminary
incision through the mucoperichondrium and cartilage is made
The blade is short to obviate the liability of cutting the alae of the
nose.

The Incision. The object of the incision through the muco-
perichondrium is to permit the elevation of the mucoperi-
chondrium on both sides of the septum, and for the excision
and removal of the cartilaginous and bony deflections or de-
formities of the septum. All this may be done without the
loss of mucous membrane, hence healing should be very
speedy. The incision chosen, therefore, should be one that
facilitates the elevation of the mucoperichondrium and the
removal of the framework of the septum narium with the least
consumption of time, the least traumatism to the tissue,
and the least shock to the patient. Freer's L-incision gives
the best view of the framework of the septum, especially far
back, and from this point of view it is commendable. But
on account of the lack of coaptation of the edges of the flaps
to the adjacent cut edges, healing is prolonged, as it heals
between the edges by granulation. The Hajek-Menzel in-
cision in the *septum mobile* at the antero-inferior margin

of the quadrilateral cartilage affords easy access to the cartilaginous septum and possesses the further advantage of beginning and ending in the muco-cutaneous tissue, which is tough and difficult to lacerate during the subsequent instrumentation. The Killian incision is curvilinear, beginning at the floor of the nose and extending forward and upward about ½ centimeter posterior to the antero-inferior margin of the quadrangular cartilage. This incision has the advantage of opening directly in front of the anterior portion of the septal ridge. The mucoperichondrium is also more easily elevated at this point than it is more anteriorly by the Hajek-Menzel incision, where the mucocutaneous membrane is quite adherent. After all the operator should be guided by his own preferences and individual experience. The operation has been and is being done most successfully and completely through all the foregoing incisions including that of Freer. The instruments used determine to a large degree the choice of incision. With my swivel knife and Hajek's elevators and gouge there is little necessity for a complete open view of the deeper portion of the septum. The operator's sense of touch, and the contour of the septum guide him unerringly to the goal of complete removal of the obstructive deviations. Then, too, Killian's speculum rhinoscopia media may be used to separate the two mucoperichondria so as to give a clear view of the deeper bony parts. By Freer's method a clear view and an open field are essential.

Freer has done a distinct service to rhinologic surgery in perfecting his method of the window resection and his splendid results justify his method. If, however, another method easier to perform, and of shorter duration, and giving equally good results can be devised, rhinologic surgeons will be most fortunate.

The operations of Hajek-Menzel and Killian appeal to me as rational, simple, and effective, hence my endeavors have been chiefly along their lines. I often make the Killian incision on account of the ease with which the mucoperichondrium is started in its elevation, and because it obviates the necessity for the use of subperichondrial injections of Schleich's mixture.

I have used Freer's L-shaped incision in a few cases with a prominent bony ridge. The V-shaped mucoperichondrial flap is not dissected by Freer's method but by the Hajek ele-

vators. Only the perpendicular incision is made prior to the
elevation of the membrane. After the membrane on the side
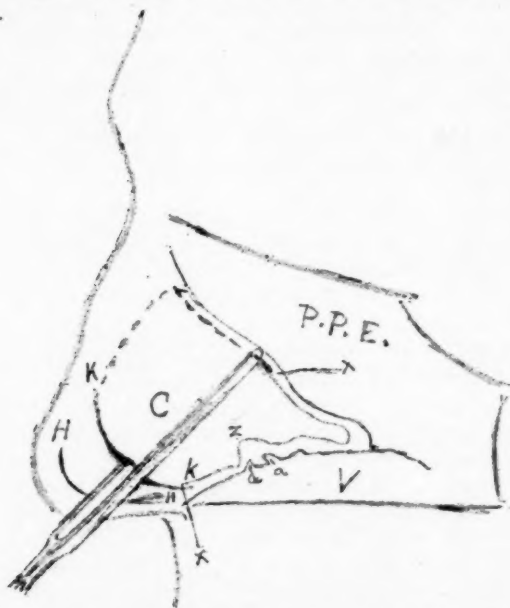of the ridge and perpendicular incision is elevated above the

Fig. 3. H.H. Hajek-Menzel incision.   K.K. Killian incision.
X.X.   The swivel knife should be placed astride the cartilage
at the lower X, and made to follow the outline of the vomer, per-
pendicular plate, and the ridge of the nose to the upper extremity
of the incision K.K., or H.H.   A.A. Spicules of bone upon which
the swivel blade may engage.   Z. Showing the right angle move-
ment of knife to disengage it from the bone spicules.   C. Cartilag-
inous portion of septum to be removed with the swivel knife in
one piece.   V. The vomer.   P.F.E. Perpendicular plate of the
ethmoid.

In this figure the mucoperichondrium is removed so as to show
the instrument and anatomical landmarks. In operating, the muco-
perichondrium is left intact, the instrument being between the
membranes of the septum.

ridge, the incision is extended along the crest of the ridge.
This completes Freer's incision and converts the elevated
membrane on this side of the septum into a flap which is
tucked into the upper part of the nasal cavity out of the way.

The cartilage is incised along the perpendicular incision and the elevation of the mucoperichondrium on the opposite or concave side is done through it as heretofore described. The cartilaginous portion of the septum is then removed with the swivel knife within a few seconds. The ridge and perpendicular plate of the ethmoid are brought into full view by this incision and are easily accessible. I am not fully prepared to recommend this incision as healing is delayed by it for several days. If, however, the ridge and perpendicular plate are not accessible by the anterior incision it may be well to extend it along the crest of the ridge.

In my description I shall refer to Killian's incision (Fig. 3, k k) unless otherwise specified. As Killian's article appears in the *Annals of Otology* simultaneously with mine I will omit a detailed description of the incision and refer the reader to his article. One point should be emphasized, namely, be sure to carry the incision through the mucous membrane and perichondrium, and a little way into the cartilage. If this is done there should be little difficulty in starting the elevation of the mucoperichondrium. If, on the contrary, the incision is not carried through the perichondrium the elevator will meet with great resistance. When such resistance is encountered, stop at once and complete the incision. My rule is to extend the incision until I can see the sharp edges of the cut cartilage when the tip of the nose is bent to one side. Under no circumstances should the incision be extended through the opposite mucous membrane, as to do so will cause a permanent perforation unless the incision on one side is closed by suture.

Where there is a sharp angular ridge coming well forward I prefer Hajek's incision (Fig. 3, H H) at the antero-inferior margin of the quadrangular cartilage as it affords better access to the bony ridge, without the danger of lacerating the mucoperichondrium. In Killian's incision the lower end corresponds to the anterior end of the crest. When the incision thus begins upon the crest of the ridge, the mucoperichondrium is easily torn during the elevation and the removal of the bony crest. By Hajek's method this unfortunate occurrence is less apt to happen as the incision is somewhat anterior to the crest, and is through tough resisting mucocutaneous membrane. When the Hajek incision is used I do not see that it makes the slightest difference on which side of the septum it is made, excepting for the convenience of

the operator. Personally I make it on the left side of the
septum as I am right-handed. This leaves my left hand free
to manipulate the tip of the nose during the incision. All
other writers recommend that the incision be made on the
side of convexity. My rule is as follows:

a. If the deflection or ridge is slight and well back I make
the incision by Killian's method, on the left side of the septum,
regardless of the side of convexity.

b. If the deflection or ridge is prominent and well for-
ward I make the incision by Hajek's method, on the left
side of the septum, regardless of the side of convexity.

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Fig. 4.   Hajek's mucoperichondrial elevators with handles
adapted to the author's use. One is semi-sharp, the other blunt.

Fig. 5. This shows the semi-sharp elevator beneath the muco-
perichondrium with the flat surface against the cartilage. This
elevator is rarely used except to start the elevation, as its sharp
end might perforate the membrane. Figure 6 illustrates the prin-
ciple that should be used to elevate the mucoperichrondrium, i. e.,
it should be lifted rather than dissected from the cartilage.

There are no objections to making the incision on the side
of convexity in *all* cases, provided the operator can do so
without jeopardizing the result of the operation. I think it
a mistake to lay down hard and fast rules concerning this or
any other step of the operation. Surgery is, after all, an in-
dividual equation rather than a formula. One can, therefore,
only express his personal preference and experience, hoping
thereby to stimulate others to undertake the work and to in-
dividualize it to suit their appliances and temperament.

The Elevation of the Mucoperichondrium. Hajek's semi-
sharp elevator (Fig 4) should be used to start the elevation,
while the dull ovoid elevator should be used to complete it.

The semi-sharp elevator is introduced into the incision of the mucous membrane, and with gentle backward pressure is moved upward and downward along the line of the incision until it loosens the anterior portion of the mucoperichondrium. (Fig. 6.)

The elevation should not be carried backward with this instrument more than one-fourth inch, as to carry it further might lacerate the mucous membrane. When therefore, the semi-sharp elevator has fairly started the elevation of the mucoperichondrium, the ovoid elevator (Fig. 6) should be introduced through the incision between the perichondrium

Fig. 6. The blunt or ovoid elevator with which the mucoperichondrium is separated after having started it with the semi-sharp one. The drawing illustrates the manner in which the perichondrium is lifted ahead of the blunt end of the elevator. The sharp instrument would constantly be liable to injure the perichondrium.

and the cartilage and pushed backward one-half inch or so, and then it should be moved upward and downward, and then backward, and up and down, until the entire operative field (Fig. 7, dotted line) has been separated. When this is done the ovoid elevator should be passed over the operative field, especially around its outer limits, so as to be sure that the mucoperichondrium is elevated at all points. Care should be exercised to elevate the membrane near the bridge and along the ridge of the nose so that the necessary amount of cartilage may be removed. Opposite the middle turbinated bodies there is often a deviation causing the middle turbinate to come in contact with the septum (Fig. 7a). The turbinated body can be made to swing outward with the pressure of the ovoid elevator through the mucoperichondrium, hence it is no hindrance to the elevation at this point.

The next step in the operation consists in completing the incision through the septal cartilage (if Killian's incision is

used). This is done with a small, short-bladed scalpel (Fig. 2). The scalpel should follow the general direction of the original incision through the mucous membrane, and should be manipulated delicately, cutting the cartilage layer by layer until the mucoperichondrium of the opposite side is reached. If the operator is inexperienced it is well for him to intro-
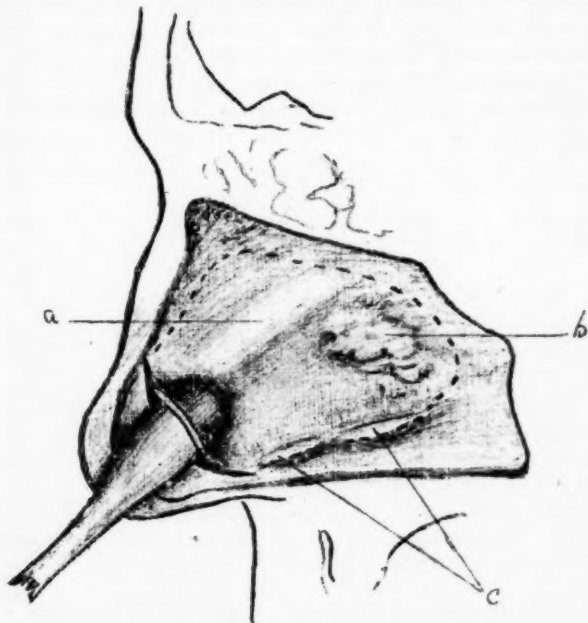

Fig. 7.   a. High deviation of cartilage and perpendicular plate opposite the middle tubinated body.   b. Irregular or gnarled deformity of the perpendicular plate.   c. Ridge at junction of the vomer and perpendicular plate. The semi-sharp elevator is shown starting the elevation.   The dull one should now be substituted for it.

duce the index or little finger of the left hand into the opposite nostril, so that he can be guided by the sense of touch in determining when the incision is through the entire thickness of the cartilage. When the point of the knife is through the cartilage it is appreciated at once by the finger in the opposite nostril. Under no circumstance should the mucous

membrane of the opposite side be incised as to do so will result in a permanent perforation of the septum, unless the incision upon one side is sutured before the dressings are introduced.

Having completed the cut through the cartilage the semi-sharp elevator should be introduced through the incision with its flat surface resting against the opposite side of the cartilage. It should now be gently pushed backward with an up and down motion to separate the anterior portion of the muco-perichondrium from the cartilage. When the elevator has separated the mucoperichondrium for about one-fourth of an inch, it should be abandoned and the ovoid elevator intro-
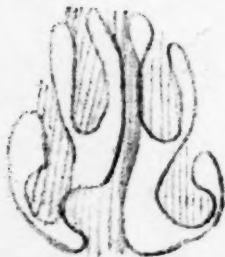
Fig. 8. Showing a double deformity of the septum. Above the septum bends to the left side of the nose, while below there is a large ridge. Both these obstructive lesions can be removed at one sitting by the submucous method of operating. Heretofore we have been obliged to remove a portion of the middle tubinated body on the left side and the ridge in two operations, each of which required from two to four weeks for healing.

duced in its stead. This should be pushed backward with an upward and backward motion until the entire area (Fig. 7) of the operative field upon that side is elevated.

Having thus roughly outlined the procedure, I will now call attention to a few of the limitations and difficulties sometimes encountered. The first of these is in starting the elevation. Simple as this procedure seems it is, nevertheless, to the beginner difficult as it may result in considerable laceration of the mucosa. The secret of success consists in completely incising the mucoperichondrium when making the incision. It should be remembered that there are two membranes to be incised, namely, the mucous membrane and the perichondrium. These are loosely attached to each other,

hence if the mucoperichondrium is not completely incised the
elevator engages between the membranes. While they are
rather loosely attached, they are, nevertheless, difficult to sep-
arate. If the elevator meets with considerable resistance,
the procedure should be stopped at once, and the scalpel again
used to complete the incision through the perichondrium. In
order to be sure that the mucoperichondrium is completely
cut through it is my custom to carry the incision a little way
into the cartilage. When this is done it can be shown by
turning the tip of the nose to the opposite side, thereby bring-
ing the sharp-cut edges into view. Having done this, rein-
sert the semi-sharp elevator and begin at the edge of the in-
cision and engage it beneath the mucoperichondrium. When
this is done the perichondrium readily separates from the car
tilage in nearly every instance. Having thus successfully
started the elevation, it should be completed with the dull or
ovoid elevator.

Another point of some practical importance is, that there
is frequently an adhesion of the mucoperichondrium to the
cartilage near the floor of the nose. When the sharp elevator
cannot be made to separate the lower portion of the incision
the bistoury should be used to sever the fibrous attachment at
this point, after which the mucoperichondrium may be ele-
vated with ease to the lower limit of the incision.

A third difficulty sometimes encountered is an extremely
thin and atrophic mucous membrane, which readily tears with
either the sharp or dull elevator. When such a membrane is
present the elevation should be conducted with very great cau-
tion and slow speed.

A fourth difficulty encountered is in those septums which
while not necessarily greatly deviated from the perpendicular
plane, are, nevertheless, nodular and irregular in contour (Fig.
7b). In these cases I have found the perichondrium somewhat
difficult to elevate, and if much force is used a perforation of the
mucoperichondrium results. It is necessary, therefore, to
proceed with caution, allowing the blunt elevator to go in
the *direction of least resistance*, after which the adherent
points may be elevated with comparative ease.

A fifth difficulty encountered in the elevation of the muco-
perichondrium is in those cases in which there is an extreme
deviation of the septum to one side. This is especially true
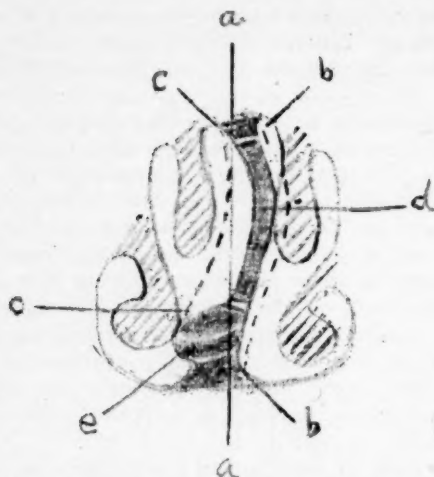when the deviation takes the form of a ridge or crest. It is

Fig. 9. a.a. Median line. b.b. Dotted line shows the extent of elevation on the side opposite the ridge. c.c. Shows the extent of elevation on the side of the ridge. d. Bend in the septum opposite the middle turbinated body. This should be removed to restore drainage and aeration to the superior meatus. e. Section through the ridge. This is best removed with the special gouge.
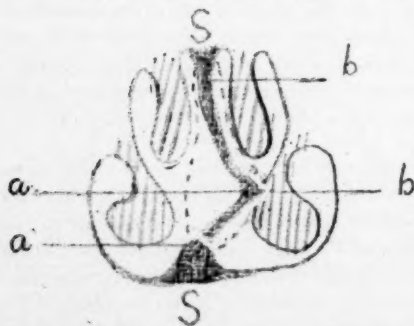

Fig. 10. S. S. Septum. a.a. Lower portion of cartilaginous septum to be removed separately with the swivel knife. b.b. Upper portion of the cartilaginous septum to be removed separately with the swivel knife. The enormous angular bend of the septum at a.b. may make it impossible to pass the prongs of the swivel knife over it so as to remove the cartilage in one piece. On the convex side at a.b. the operator should not attempt to elevate the mucoperichondrium lest he tear it.

possible in nearly all such cases to elevate the mucoperichon-
drium above the ridge (Fig. 9 c c) whereas, it is usually diffi-
cult or even impossible to do so below it. Indeed, I have
found it unnecessary in the majority of my cases to attempt
to elevate below the crest. I content myself, therefore, to
limiting the elevation on the side of the ridge to the area
above it. As a rule the larger portion of the crest or ridge
is composed of bony tissue and should be removed submu-
cously with the V-shaped gouge as will be hereinafter de-
scribed.

A sixth difficulty encountered in the elevation of the muco-
perichondrium is in those cases in which the cartilage pre-
sents a sharp angular deflection in a horizontal direction (Fig.
10). In these cases the angular deflection is situated higher
than it is where there is a bony ridge or crest. It may be
possible, therefore, to elevate the mucosa both below and
above the angle of the deviation. In such cases the operator
should not attempt to pass the elevator over the angle of the
deviation on the convex side, as to do so might result in a
laceration of the mucoperichondrium. In elevating the mem-
brane on the concave side of the septum it is usually quite
easily accomplished with the blunt elevator, even in the
trough of the cartilaginous deviation, as the membrane sepa-
rates in advance of the blade (Fig. 6).

*The Swivel Knife in the Removal of the Cartilaginous Sep-
tum.* Having elevated the mucoperichondrium upon the two
sides of the septum the swivel knife (Fig. 1) should be in-
troduced into the lower part of the incision, care being ex-
ercised to have the prong-tips within the cavity of the muco-
perichondria, while the blade, resting between the tips, en-
gages the cartilage. This is not difficult to do provided the
adhesion to the septum in the lower portion of the incision
has been previously cut with the bistoury. When this is not
done there is sometimes considerable difficulty in getting the
mucous membrane on the side of the incision to "balloon"
enough to admit the prongs. To facilitate the insertion of
the prong-tips I sometimes use the Killian speculum rhino-
scopia media to separate the mucoperichondria until the
prong-tips are inserted and the blade is pushed backward
through the cartilage one-fourth of an inch or more. In
many cases I instruct the patient to inhale forcibly, which

often results in a "ballooning" of the mucoperichondria, thus obviating the necessity for using the speculum. It is then easy to insert the swivel knife.

Having successfully placed the prong-tips astride the incised cartilage and between the mucoperichondria, the knife should be pushed backward along the floor of the nose, hugging the superior border of the vomer until it reaches the most posterior portion of the cartilage, namely, at the junction of the vomer and perpendicular plate of the ethmoid (Fig. 3). The prong-tips should then be directed upward and forward, hugging the antero-inferior border of the perpendicular plate of the ethmoid, until it reaches the region of the nasal bones. It should then be pulled downward parallel with the ridge of the nose until it emerges through the superior portion of the incision. By this procedure almost the entire quadrangular cartilage may be excised with the swivel knife. The anterior tip of the excised cartilage should be seized with a pair of dressing forceps and removed through the incision (Fig 3 kk) in the mucoperichondrium.

Some of the difficulties to be encountered in this procedure are the following:·

1. The swivel knife sometimes becomes engaged against the little irregular spicules of bone projecting from the upper margin of the vomer (Fig. 3 a a) and the antero-inferior margin of the perpendicular plate of the ethmoid. When this occurs the prong-tips should be moved with a slight wriggling motion at right angles (Fig. 3 z) to the direction they have been traveling, and with a slight to and fro motion the blade is disengaged. The knife should be again directed as before, until the inferior and postero-superior portion of the cartilage has been encompassed.

It occasionally happens that the septum has been the seat of a perichondritis or septal abscess. In these cases it may be found that the frame work of the anterior portion of the septum is not true cartilage, but is composed of very dense fibrous or fibro-cartilaginous tissue. It may be difficult or even impossible to cut the tissue with the swivel knife unless it is very sharp. The latest model of the swivel knife has a U-shaped cutting edge which I hope will cut this tough fibrous tissue.

A third difficulty is calcified cartilage. It is not to be supposed that the swivel knife will cut through such tissue. It should be removed with a strong cutting forceps.

A fourth difficulty is found in cases with very angular deviations of the cartilage, as shown in Fig. 10. In such cases it may not always be possible for the deflected cartilage to pass between the prongs of the instrument. I have a special wide pronged swivel knife for this purpose, and have so far, found it capable of embracing the widest angular deviations. If the operator does not happen to have a wide model he should remove the cartilage in two pieces. That is, he should push the swivel knife along the floor of the nose then upward as far as possible and then cut forward along the angle of the deviation (Fig. 10 a b) to the mucoperichondrial incision. This piece of the cartilage should then be removed and the knife reinserted between the mucoperichondria to the posterior limit of the cartilage, when it should be made to engage the upper part of the cartilage and thus complete its removal.

In nearly all cases I have found it possible with my swivel knife to remove the cartilage in a few seconds. It is in this

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Fig. 11. Gouge for the submucous removal of septal ridges. The gouge is an arc of a circle and the cutting edge is v-shaped, thus enabling it to engage readily in the septal ridge.

part of the operation that a great saving of time occurs. In addition to this the specimen is preserved in its entirety for study and inspection.

The Removal of the Bony Crest or Ridge. This is done submucously with the special gouge. (Fig. 11), mallet and forceps. The gouge should be inserted through the incision between the mucoperichondria and engaged in the anterior portion of the bony tissue. A few blows with the mallet splinters the bone backward, when with gentle prying

motion the splintering process may be made to extend still
further backward. The gouge should then be disengaged and
Grunwald's straight biting forceps (Fig. 12) inserted. The
forceps should seize the splintered portion of the bony tissue
and lift it from its attachment. This process should be con-
tinued until all of the obstructing bony tissue in this region
is removed. It is not necessary to attempt to elevate the muco-
perichondrium from the under surface of the bony ridge as
the chiseling and splintering process separate it without en-
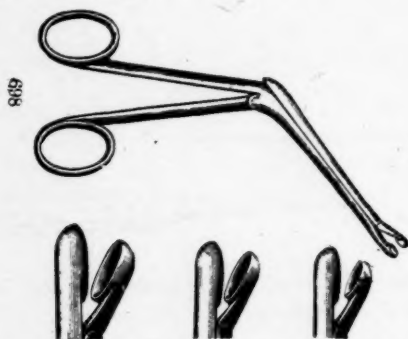dangering its integrity.

Fig. 12. Grunwald's forceps. They may be used to remove
ridges after being splintered with the septum gouge, and to bite
off small spicules of bone and cartilage.

*The Removal of the Deflected Portion of the Perpendicular
Plate.* When the perpendicular plate of the ethmoid bone is
deflected so as to obstruct the respiratory and olfactory region
of the nose (Fig. 7), it should be removed submucously by
means of bone cutting forceps, such as are described by Freer
in his paper read before the American Laryngol., Rhinol., and
Otol. Society at Boston, June, 1905, or by means of sub-
mucous saws as devised by me after Kyle's models (Fig. 13),
With the straight saw the perpendicular plate is cut as shown
in Fig. 14 aa and bb, while the connecting cut is made with
the right angle saw as shown in (Fig. 14 c. d.) The quadri-
lateral plate of bone thus outlined is seized with a pair of
strong dressing forceps and removed. This procedure re-
quires but little time and seems superior to the use of bone-
cutting forceps on account of the lessened traumatism and
the preservation of the specimen for study and inspection.

Post-Operative Inspection. Having removed the cartilaginous portion of the septum, the bony ridge and the deflected portion of the perpendicular plate of the ethmoid, the mucoperichondria should be brought to the median line with a blunt pointed applicator, or a spatula. The nasal chambers should then be inspected by anterior rhinscopy to determine whether or not there still remain obstructive malformations of the framework of the septum. If found they should be removed submucously by the means already described.

The Primary Dressing. Having satisfied himself that the entire obstructive portion of the septum has been removed the operator should lightly, but firmly, tampon both nasal chambers with sterile gauze, so as to bring the two mucoperichondria into apposition in the median plane of the nose.

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Fig. 13. Kyles septum saws. The author has modified them so as to adapt them to the submucous resection of the perpendicular plate of the ethmoid.

The dressings thus applied aid in preventing hemorrhage and hematoma between the membranes. Should a hematoma form it separates the membranes, the clot becomes organized, and a permanent obstructive thickening remains. After twenty-four to forty-eight hours the dressing should be removed, and, if the mucoperichondria are not unduly lacerated, healing by first intention will have taken place. If, on the contrary, there was extensive tearing of the membranes during the course of the operation, or if infection of the wound has taken place, it may require several days for complete union and healing. I have rarely found it necessary to introduce a second dressing.

The After Treatment. The after treatment consists, chiefly, in preventing the formation of crusts at the point of incision. In two of my cases the crust were of horn-like consistency and adhered closely to the mucous membrane. I removed the crusts by tamponing the nasal chambers with gauze moistened with a 10% solution of ichthyol, leaving them in place for twenty minutes, after which the crusts were readily removed without

injuring the epithelial covering of the mucous membrane. I
instructed the patients to use sterilized vaseline in the an-
terior portion of the nares twice a day. After two or three
weeks the horn-like crusts disappeared. In the majority of
cases the crusts in this region are composed of dried secre-
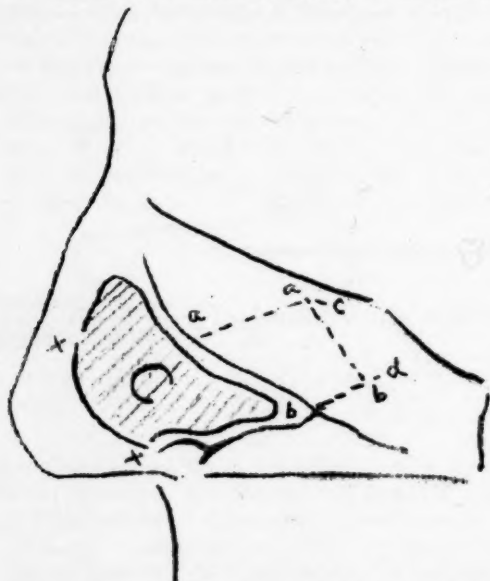tions and are easily removed by sprays or irrigations. The

Fig. 14. c. Cartilage removed with the author's swivel knife.
x.x. Killian's incision. a.a. and b.b. Submucous cuts made with
author's modification of Kyle's septum saws. c.d. Perpendicular
cut made with author's modification of Kyles' right angle septum
saw. The area enclosed within these lines is removed en masse
with a dressing forceps.

spraying or lavage of the nasal mucous membrane should be
continued for a few weeks, or until such time as the crusts
cease to form.

The Advantages of this Method of Operation. 1. It prom-
ises to be the most speedy method yet devised for the sub-
mucous resection of the septum. The lessened time required
for the operation is chiefly accounted for by the use of the
swivel knife for the removal of the cartilaginous portion of

the septum, and by the use of the submucous saws for the removal of the perpendicular plate of the ethmoid.

2. The use of the swivel knife in the removal of the cartilaginous portion of the septum reduces the shock and traumatism to the minimum.

3. The use of the submucous saws for the removal of the perpendicular plate of the ethmoid also reduces the shock and traumatism.

4. The deviated cartilaginous portion of the septum and the perpendicular plate of the ethmoid are removed in their entirety and are thus preserved for inspection and study.

5. Because of the lessened shock and traumatism, and the shortened time of anesthesia and operation, infection is less apt to occur, and healing usually takes place by first intention.

6. Fewer post-operative dressings are required.

7. The after treatment is shortened.

NOTE.—The instruments used by the writer for the submucous resection of the cartilaginous portion of the septum are manufactured by the surgical department of F. A. Hardy & Co., of Chicago, under the personal direction of Mr. L. R. Kratzmueller. It is essential that the blade of the swivel knife be very sharp, and that it be made of the very best steel. It should also swing freely between the prongs and be riveted to them. Mr. Kratzmueller exercises great care and interest in their construction, hence I confidently refer the reader to him for the instruments mentioned in this paper.

The writer has devised several types of swivel or universal cutting knives, including a single-pronged knife, the trowel-shaped handle, the angular handle, etc. He has also devised a knife using a strand of steel wire between the prongs' tips instead of the swivel blade. Another model utilizes a cautery wire between the prong-tips. After some experience in their use he recommends the straight instrument illustrated in this article. While the steel wire cuts cartilage it does so with considerable resistance. The cautery is complex, causes reaction and retards healing. The single-pronged swivel knife works well, and in extreme deviations of the cartilaginous septum has special advantages over the two-pronged swivel knife. The angular and trowel-shaped handles keep the operator's hand out of the line of vision, but they allow the instrument to turn while in use. I, therefore, recommend the

straight-handled, double-pronged swivel knife shown in Fig 1 as the best, all-round instrument. Hajek's elevators seem to be ideal. Their thickness is their chief merit. The thickness lifts the membrane ahead of the tip of the instrument, thereby lessening the liability to perforation.

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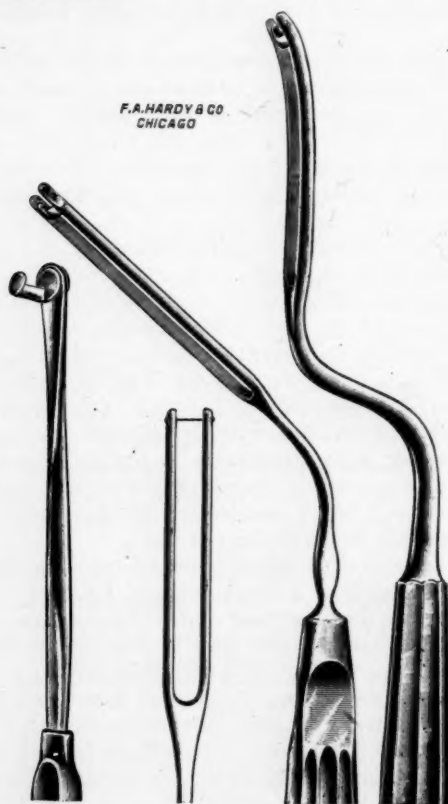

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Fig. 15.   Fig. 16.   Fig. 17.   Fig. 18.

Figs. 15, 17 and 18 show other models of the author's swivel knife. They are not recommended, however, as the one in Fig. 1 has proven most satisfactory. Fig. 16 shows a universal cutting knife, a steel wire stretched between the prongs forming the blade. It cuts with considerable resistance and is not recommended.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINO-LOGIC AND LARYNGOLOGIC LITERATURE.

I.— EAR.

Contribution to the Study of Unusual Forms of Bezold's Mastoiditis with a Report of a Fatal Case Following Ligation of the Jugular Vein.

Luc (*Revue Hebdomadaire,* April 15, 1905.) The patient was a man of fifty with an acute suppuration of the left ear of five weeks' duration, following the injection of water into the nose.

When seen by Luc there was a small perforation in the posterior superior quadrant. There was difficulty in moving the head and pain on pressure over the mastoid and upper portions of the upper sterno-cleidoid: an enlargement of the opening in the drum was made at that time. Four days later —improvement not taking place—the mastoid was opened. No infiltration below the tip was discovered.

Four days later, with elevation of temperature, torticoles occurred with swelling over the muscle. An incision into the muscle was made without finding pus. A week later the temperature became high. Upon examination, pus was found upon the lower wall of the antrum. Pressure over the neck also forced up pus. A second operation was accordingly performed, and an enormous amount of pus was discovered beneath the deep tissues of the neck.

Two days later erysipelas developed, which persisted for ten days. Suddenly there was the development of great increase of fever without involvement of any of the thoracic organs.

At the time of the first operation, the lateral sinus had been exposed and so had been bathed in pus which had flowed up from the neck. A phlebitis of this vein was suspected although the temperature was not of a pyemic character.

On the following day the vein was excised and the sinus opened and found filled with a clot which was thoroughly removed together with the wall. This operation lasted an hour and not more than twenty-five drachms of chloroform were used.

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The patient never recovered from the anesthetic.

The case is critically considered by the author who regards it as a mistake that the presence of pus in the neck was not earlier recognized, and dwells at considerable length on the cause of death which he cannot ascribe to chloroform shock or to a septic condition, but rather believes it due to a lesion of the central nervous system, which might have been avoided if the jugular had been tied above the junction of the thyro-linguo-facial branches instead of below them.

Harris.

Concerning Regional Anesthesia of the External Auditory Canal.
(Zur regionaren Anasthesie des aeusseren Gehoerganges.)....

LAVAL, P., (*Archiv. für Ohrenheilkunde*, Vol. 64, Nos. 2 and 3, 1905.)   v. Eicken has recently published his results in regard to anesthetizing the external canal, and has also given the results of his investigations in local anesthesia of the middle ear in performing ossiculectomies.

The author's observations made independently of v. Eicken, in Schwartze's Clinic, are given in this paper. Laval produces local anesthesia of the nerves supplying the auditory canal. The operative field is supplied by three branches, with sensory fibres, whose anatomical relations the author determined with accuracy on cadavers.

Anteriorly the n. meatus acustici externi, a branch of the auriculo-temporalis, extends through the canal close to the lateral border of the bony canal, and distributes two or three fibres along the anterior wall. A branch of the auricularis n. vagi, also supplies the anterior part of the canal, dividing into two branches. It supplies the posterior wall of the canal, and the larger portion of the tympanic membrane. The third nerve is a branch of the n. auricularis magnus. It supplies a portion of the concha and the lobulus with sensory fibres. In the majority of the operative procedures, in the region of the auditory canal, the first two mentioned nerves are of importance, although cases occur in which anesthesia of the third nerve suffices to allow painless operations. After disinfecting and anesthetizing the external skin with a spray of ethyl chlorid, the needle of the Pravaz syringe is entered about ½ cm. in front of the tragus and carried up in the direction of the floor of the canal to a depth of 1½ cm. About ½ ccm. is injected here. While this is being done

the mouth of the patient should be kept wide open. In the same way, the vagus branch can be reached, if the needle, while gentle traction is made on the concha, is carried out close behind the fold of the ear, between the cartilage and bone of the mastoid process, and about 1 cm. directly down.

The author uses for his injections a solution of Braun's cocain-suprarenin tablets, one in 1 ccm. distilled water.

One tablet contains 0.01 of cocain, 0.00013 of suprarenin, and 0.009 natr. chlor. One ccm. of physiological salt solution is also added, so that the solution contains ½ per cent cocain in normal salt solution. For men he uses a 1 per cent solution, and for women and young people a ½ per cent solution.

Anesthesia is obtained in about five minutes, and usually lasts fifteen or twenty minutes. Injections as well as operations were always painless. Symptoms of intoxication were never observed.

During the summer of 1904, the author operated upon 11 cases, and during the past winter upon 4. The majority of the operations were for furunculosis of the canal, although the author has also used this method for ossiculectomies, and for performing paracenteses.

In conclusion, the writer states that regional anesthesia will certainly be distinctly useful in operations upon the external canal. The operation for furunculosis can be much more thoroughly performed by this method than was formerly the case, and can be rendered absolutely painless.   *Theisen.*

A Case of Secondary Purulent Otitis Media, Complicating an Em pyema of the Maxillary Antrum. (Ein Fall von sekundaerer Otitis media purulenta, im Anschluss an Empyem der Highmorshoehle.)

KONIETZKO and ISEMER (*Archiv. für Ohrenheilkunde,* April 27, 1905.) At the post-mortem examination of a woman who had died of general sepsis, an involvement of the middle ear was suspected because when the brain was removed, a discoloration of the dura in the region of the temporal bone was noticed. The authors were enabled to determine the existence of an empyema of the left maxillary antrum with a complicating purulent otitis media.

The atopsy findings were as follows: The dura was smooth, barely transparent, vessels partly filled. The inner surface also smooth and covered with partly yellow, and partly light-

red fine, non-adherent membranes; at the base, a greenish-yellow discoloration in the region of the tip of the left temporal bone. Meninges soft and transparent, with the exception of a slight cloudiness of the posterior parts of the left parietal and occipital lobes.

On section of the dura at the base of the skull, at the above mentioned discolored region, a purulent coating was found between this and the pars basilaris of the occipital bone. The left half of the body of the sphenoid, and a portion of the pars basilaris of the occipital were chiselled out, and the left pterygo-palatine fossa and pharynx uncovered.

The tissue under the bone was found to be grayish-black in color and necrotic. The posterior superior wall of the left superior maxillary bone was carious toward the ptyergo-palatine fossa and broken through, the opening being as large as a cent. After enlarging this opening, the antrum of Highmore was found to be filled with putrid pus.

The sphenoidal sinuses were opened and found normal, as well as the left ethmoid labyrinth, whose most posterior cell dipped deeply into the body of the sphenoid.

After removing the left temporal, the venous plexus surrounding the internal carotid, particularly in the course of the bony carotid canal, was found partly thrombosed and partly suppurating, and the perivascular tissue discolored and necrotic. After removal of the bony wall, the tympanic membrane was found to be intact and transparent, but pus could be seen shining through it. The tympanum was opened by removing the tegmen tympani, and was found filled with yellow pus, as was the tube, the mucous membrane of both being somewhat thickened. Aditus, antrum, labyrinth and bony walls of the middle ear were found to be normal. No thrombus was found in either the jugular vein, the bulb, or sigmoid sinus.

The authors believe that the primary disease was in the antrum of Highmore.

As before mentioned, the posterior superior wall was carious and perforated and from there the inflammatory process extended by way of the cellular tissue of the pterygo-palatine fossa through the Vidian canal, and caused a thrombosis of the venous plexus about the internal carotid. From there the infection could easily extend toward the pars basilaris of the occipital bone and also to the lymphoid tissue sur-

rounding the tube, and cause the tensor tympani muscle to become diseased. By way of this muscle, the inflammatory process extended to the tympanic cavity.

The patient died of general sepsis before aditus, antrum, etc., became involved. The fact that the tympanic membrane, aditus, antrum, and labyrinth were found normal, proves that the infection did not start in the middle ear. There are only five cases in the literature of empyema of the maxilary antrum with fatal complications.

The author's case is probably the only one complicated by secondary purulent otitis media.   *Theisen.*

The Distribution of the Blood-Vessels in the Labyrinth of the Ear of the Sheep and of the Calf.

SHAMBAUGH, Chicago, (*Archives of Otology*, Vol. xxxiv, No. 2.) In working out the circulation in the labyrinth of the ear of the domestic pig, the author noted striking variations in the course of the blood vessels from that described for the human ear. In making preparations of the bloodvessels in the labyrinth of the sheep and of the calf, the variations found between these and the pig were as striking as those found between the pig and the description in literature of the vessels in the human ear. A comparative study leads to the following conclusions:

1. The scheme for the arterial supply to the vestibule and semicircular canals is a constant one, and consists, first of a separate branch of the labyrinthine artery, the anterior vestibular artery, which supplies the macula acustica utriculi and the anterior crura of the superior and lateral semicircular canals; second of a single trunk, the posterior vestibular artery, or of two trunks, which come from the labyrinthine artery at the base of the cochlea and supply the posterior crura of the posterior and lateral semicircular canals and the crus commune. A small artery, a branch of the posterior vestibular artery, leaves the vestibule along the aquaeductus vestibuli.

2. Anastomotic loops between the several branches of the labyrinthine artery in the bottom of the meatus acusticus internus and at the base of the cochlea were most pronounced in the labyrinth of the calf and least in that of the sheep.

3. The scheme for the arterial supply to the cochlea varies widely in its details for the three species. In the sheep and the calf, branches from the labyrinthine artery radiated over the

under surface of the basal coil and one of these small arteries left the labyrinth along the canaliculus cochleæ. In the labyrinth of the pig, the arteries under the basal coil were not found, and the vessels about the canaliculus cochleæ were embedded in the capsule and were consequently destroyed by the corrosion, except in young embryos where the capsule was still cartilaginous and did not require removal in making the celloidin casts. Yet in the latter preparations I was enabled to find an artery leaving along the canaliculus cochleæ.

4. Between the spiral vessels lying under the funnel of Corti and the vessels in the ligamentum spirale, communications were found in all three species. These consist of small, straight veins, which appear at irregular intervals.

5. The venous blood from the cochleæ in all three species empties into the vena canaliculi cochleæ. In none were any veins found in the meatus acusticus internus which received tributaries from the cochleæ.

6. In all three species, the venous blood from the vestibule and the semicircular canals drains into the vena canaliculi cochleæ, with the exception that in the calf the vein from the crus commune often leaves the labyrinth along with the aquaeductus vestibuli.

7. The membrana vestibularis is supplied with a network of vessels in the sheep and the calf, but in the pig no vessels were found in this structure.

8. Two large veins, the anterior and the posterior vestibular veins, collect the blood from the vestibule and the semicircular canals in the pig and the calf, their destribution being the same as for the anterior and posterior vestibular arteries respectively. In the sheep the anterior vestibular vein is wanting, its place being taken by the posterior vestibular vein, which collects the blood from the whole of the vestibule and the semicircular canals.

9. The location of the vessels in the semicircular canals in all three species is the same. The arteries for the most part cling to the endosteum, lying along the concave side of the osseous canal; the veins and the capillaries are confined to the membranous canals.   *Campbell.*

The Pathology of the Infant's Ear Underlying Aural and General Disease.

, KENEFICK, New York, (*Archives of Otology*, Vol. xxxiv,

No. 2.) Under ordinary conditions pyogenic microörganisms
from food and inspired air may invade the cavities of the tem-
poral bone without special disturbance, but in the presence of
lowered vitality from disease, conditions favorable to the de-
velopment of these pyogenic organisms and the elaboration of
their toxins are brought about.

Politzer states that middle ear inflammatory exudations are
found in broncho-pneumonia, bronchitis, intestinal catarrhs
and the acute and chronic infectious diseases. Inflammation
of the faucial and pharyngeal tonsils is a common cause of
extension by way of the Eustachian tube to the tympanum.

In middle ear inflammation the tension may be so great as
to cause convulsions, or where there is incomplete osseous
protection, paralysis of the facial nerve. Where no sufficient
outlet has been provided by spontaneous puncture or para-
centesis, pus may escape upward and outward through, the
Rivinian fissure in the antral roof and backward between
bone and periosteum to form an abscess immediately behind
and above the ear.

Again, pus may escape through the imperfectly closed roofs
of the antrum and tympanum to the middle cranial fossa
causing an epidural or cerebral abscess. Infection may ex-
tend through the imperfect floor of the tympanum, setting up
thrombosis in the jugular sinus and bulb.

So subtle is the method of extension of infective micro-
örganisms, especially along the sheaths of nerves and the
walls of lymph and blood-vessels, that there is scarcly a sin-
gle intracranial infection of otitic origin which may not oc-
cur without rupture of the mt. and without apparent lesion
of the internal protecting structures of the skull.

As to general disease with which severe ear disease is fre-
quently associated, scarlet fever easily leads. The progress
of the otitis may be characterized by the most severe and
rapid inflammatory process, ending not only in destruction
of the contents of the tympanum, but involving the internal ear
and cerebral structures directly through the labyrinthine wall.
Scarlet fever destroys the internal ear from without, cerebro-
spinal meningitis on the contrary invades from within the
brain, passing from the neighboring meninges to the aqueduct
of the cochlea and vestibule affecting both the hearing and
the equilibrial branches of the auditory nerve as well as its
trunk and nuclei. Hence the staggering gait and hopeless
deafness of those who recover.   . . *Campbell.*

The Anatomy of the Child's Ear, Emphasizing Points of Practical Importance.

. BRYANT, New York, (*Archives of Otology,* Vol. xxxiv, No. 2.) At birth the temporal bone is soft and spongy, mostly diploic, except the capsule of the labyrinth, which is dense bone. At the close of the first year it is quite solid, yet thin.

The temporal bone, at first, is very vascular, traversed by many foramina containing vessels which allow free circulation of the blood between all the surfaces of the bone.

The annulus tympanicus is firmly attached by its apices to the outer plates of the squamous bone. The petro-mastoid portion is separated from the squamous by a cartilaginous plate and the petro-tympanic suture is wide open, but before the end of the first year all the parts are united.

The walls of the mastoid antrum are of spongy bone. The outer one made by the posterior process of the outer plate of the squama is softer and thinner than the tegmen which explains the readiness with which post-aural abscesses occur in infancy.

The development of the mastoid begins about the second year and is completely developed shortly after puberty, at which time the groove of the sigmoid sinus is fully formed.

The tympanic cavity of the infant is about as extensive as in the adult. Sieve-like bone separates the floor of the tympanum from the carotid canal and from the jugular fossa. The oblique position of the meatus and this thin plate of bone would permit a puncture of the jugular bulb during paracentesis. At birth there is coaptation of the superior and inferior walls of the external auditory canal and of the mt. with the inferior walll. The irregularities are filled with desquamated epithelium. A few days after birth the meatus slowly opens forming an hour-glass shaped canal with the construction corresponding to the isthmus in the adult. At birth half of the meatus is membranous and the other half cartilaginous.

The tympanic air cavity does not exist at birth, the osseous cavity being filled with myxomatous tissue and cellular detritus. The mt. is the same size as in the adult. The contents of the tympanum proper are fully developed at birth.

Campbell.

Otitis Media in Children.

JACOBI, New York, (*Archives of Otology,* Vol. xxxiv, No.

2). Otitis may be either a mere surface inflammation or one complicated with thrombosis or suppuration, or caries, or facial paralysis or meningeal complications. It may be primary or secondary to a naso-pharyngeal disease, be caused by or appear contemporaneously with pneumonia, cerebro-spinal meningitis or enteritis.

Preysing found in the autopsies of 100 infants dead of a variety of diseases, 154 diseased ears and of these in only 9, was there a perforation of the mti. This infrequency of perforation is believed to be due to several reasons:

1. The greater resistance of the mt. in the young, the external cutis layer being often thicker than in the adult and the median connective membrane very solid.

2. In the young the Eustachian tube is short but wider and the direction of the canal almost horizontal.

Campbell.

The Operative Treatment of Diseases of the Ear in Childhood.

DENCH, New York, (*Archives of Otology*, Vol. xxxiv, No. 2.) Whenever a child is found suffering from an acute inflammation of the middle ear giving rise to a persistent increase in temperature, operative treatment is imperatively demanded.

Early and free myringotomy in all cases of acute otitis in childhood is urgently called for. The younger the patient, the earlier should this simple operation be performed. Where there is any sinking of the upper and posterior canal wall, the incision should be carried well outward on to the superior wall of the bony meatus.

Of the various complications in acute middle-ear inflammation one deals with them as in the case of adults. In mastoiditis operate earlier as inflammation is more prone to spread, particularly to the meninges. Pus often escapes through the Rivinian segment, forming a post-aural abscess without any rupture of mt.

In all cases of middle-ear inflammation in childhood, where free myringotomy does not relieve pain and temperature at the end of a few days, the mastoid should be opened.

Infection may extend to the bulb either with or without mastoid involvement. Where there are marked intermissions in the temperature, one should suspect sinus involvement. If both ears are involved both sinuses should be in-

cised and explored after doing the complete mastoid operation.

An epidural abscess is seldom diagnosed before operation is made upon the mastoid and with a large operative field, removal of all diseased bone will lead the surgeon to the discovery of any collection of pus between the dura and the skull. In draining this never break down the adhesions limiting the abscess.

General or diffuse meningitis is very fatal. Infection usually takes place through the antral or tympanic roof. If the diagnosis is made extremely early and the site of infection packed off from the general cranial cavity by means of iodoform gauze, occasionally the patient may recover.

A number of cases of serous meningitis have been relieved by successive lumbar punctures. When these cases occur in conjunction with an otitis, thorough operation also must be undertaken on the mastoid and middle-ear.

The localization of brain abscess is more difficult than in the adult. The most frequent site is in the middle cranial fossa, the tempero-sphenoidal lobe. Free exploratory incision is the only feasible method of discovering these abscesses.

The chronic middle-ear inflammations of childhood rarely require operative measures. The upper air passages should be put in a thoroughly healthy condition. Enlarged tonsils and adenoid should be removed. General hygiene should be looked to, and frequent colds should be guarded against by the daily use of a cold sponge bath and suitable underwear.

In suppurative cases, systematic cleansing of the ears by use of antiseptic solutions. General measures failing, the radical mastoid operation must be undertaken, and an important point is to secure an exceedingly large and potent external auditory meatus.   *Campbell.*

II.—NOSE AND ACCESSORY CAVITIES.

An Earnest Plea to Classify Lupus of the Nose as a Form of True Tuberculosis.

MASSEI (*Revue Hebdomadaire,* March 11, 1905.) The author shows conclusively that both histologically and clinically lupus is not to be distinguished from tuberculosis. He recognizes in lupus of the nasal mucosa two forms, *ulcerative* and *vegetative.* The ulcerative form is the rarer of the two,

insidious in its beginning. It begins in the anterior part of
the cartilaginous septum, but soon invades the entire floor,
outward and to the side. In the majority of the cases the
ulcer is single or of small dimensions, the size of a pea or
a little larger and round in form; but multiple ulcers have
been observed.

The *vegetative* form has a predilection for the same local-
ity. It is usually solitary, sometimes multiple, suggesting
granulations varying from the size of a pea to a nut. It is
of a grayish color and may suggest a "papilloma." The con-
sistance is soft and friable and it bleeds easily. It is sessile
or pedunculated.

Lupus may be confused with syphilis, polyps and rhinos-
cleroma. Thorough removal of all disease by means of the
curette is recommended as early as possible.

Electrolysis is not favored.   *Harris.*

Odors and Cardiac Troubles.

JOAL (*Revue Hebdomadaire,* April 29, 1905.)
An interesting paper in which the author sets forth claims
based on his own observations and those of others for a re-
lationship between certain functional forms of heart disease
(syncope, palpitation, precordial pains and false anginas) and
an abnormal condition of the olfactory nerve.

A similar relation between this nerve and certain symptoms
referable to the stomach and chest has already been pointed
out.

In addition to numerous quotations from the literature, the
author gives the history of fourteen cases occurring in his own
practice where treatment of the nasal condition relieved more
or less fully the symptoms complained of. In his opinion
such symptoms are dependent upon an exaggerated suscep-
tability of the nerve centres situated in the bulb and a peculiar
hyper-excitability of the filaments of the olfactory nerve.
Added to this there exists a high degree of sensibility of the
nasal branches of the trigeminal.   *Harris.*

The Real Value of Aero-thermotherapy in the Therapeutics of Oto-Rhinology.

LERMOYEZ and MAHN (*Revue Hebdomadaire,* March 4,
1905.) A conservative up-to-date presentation of the sub-
ject by its originators as far as rhinology is concerned; the

principles under which it is used are succinctly stated and the apparatus employed by them given in detail.

The hot air is to be applied directly to the point which it is desired to affect and is brought as near as possible to the surface. Duration is but a minute or two, and all due precaution is taken to protect patient from cold. He (patient) should remain in the apartment one-half hour after treatment to avoid too sudden a change of temperature. The authors summarize the results of their treatment as follows:

Excellent in spasmodic rhinitis even to being a specific in hydrorrhea nasalis.

Second, good in congestive rhinitis.

Third, fair in chronic coryza.

Fourth, useless in ozena and in all cases when suppuration from the sinuses exists.

All obstructions in the nose are first to be removed.

In the ear, heated air has a sedative effect. In otalgias of tubal or naso-pharyngeal origin it gives excellent results. In the same way, in tubal obstruction with deafness and tinnitus occurring in the course of tubal or tubo-tympanic catarrh, benefit is observed.   *Harris.*

III.— MISCELLANEOUS.

A Peculiar Form of Hyperplasia of the Mucosa.

SEMON, SIR FELIX (*Revue Hebdomadaire,* February 25, 1905.) Semon reports a case of a woman of thirty in good health who showed a general thickening of the palate including the pillars of the uvula, epiglottis, the arytenoid cartilages, etc. It had a yellowish shining appearance which one would describe as lardaceous.

Tuberculosis was considered, but excluded because all other symptoms were lacking. There was a tendency to ulceration. The case was under observation for two years. All treatment was futile. Suddenly the condition entirely disappeared. The author has observed two other cases with the same local appearance. In the third case an histologic examination was made and showed a picture similar to the second stage of hypertrophic rhinitis. Semon has found a case exactly similar to these reported by Kelley and several others that simulate it.

                                                    Harris.

Treatment of Syphilis.

CAPART (*Revue Hebdomadaire,* March 18, 1905.) The writer, speaking from a large experience, discountenances the classical divisions of the disease. Liability to mistake it or overlook it is constantly to be borne in mind.

The forms recognized are the *benign* syphilis, *grave* syphilis and *galloping* syphilis.

The first type is capable of being healed by hygenic treatment alone. The second type may even result in death. It is also marked by frequent recurrence. The third form is indicated by its name.

In the treatment the greatest importance is attached to mercury. Preference is given to hyperdermic injection of soluble or insoluble salts. The sublimate is used when speedy result is desired. The formula used and its method of use is given in full. When possible, however, the salicylate or calomel are used. They are to be employed every eight days when the dose is ten centigrammes, every five days when the dose is five centigrammes. Great attention must be paid to the thorough cleansing of the syringe and needles (which are of platinum, and five to six centimeters in length), by means of heat and ether.

The pain is variable. An abscess has never been observed.

The injection should be continued for a long time (two or three years), at longer or shorter intervals. Potash in large doses is advised for all forms of late syphilis.

Harris.

BOOK REVIEWS.

ALLING AND GRIFFIN'S DISEASES OF THE EYE AND EAR.. A Manual for Students and Physicians. By ARTHUR N. ALLING, M. D., Clinical Professor of Ophthalmology in Yale University, Department of Medicine, New Haven, Connecticut, and OVIDUS ARTHUR GRIFFIN, B. S., M. D., Late Demonstrator of Ophthalmology and Otology, University of Michigan, and Oculist and Aurist, University Hospital, Ann Arbor, Michigan. In one 12mo volume of 263 pages, with 83 illustrations. Cloth, $1.00, *net.* Lea Brothers & Co., Publishers, Philadelphia and New York, 1905.

The authors present the subjects of Ophthalmology and Otology in as clear, thorough and interesting a manner as the limited space permits.

While essentially a work for students, it will prove of great service to the busy practitioner, who wishes to keep abreast of the times and to quickly review these special subjects.

The illustrations are well chosen, numerous and effective.

James T. Campbell.

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